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Patterns of a Sustainable Grand Valley State University

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PATTERNS OF A SUSTAINABLE Grand Valley State University

Author Note

This article is a combination of a Sustainable Agriculture Place-Based Grant independent research initiative and Senior Project of the Frederik Meijer Honors College. Its impetus came from connection with, and separation from the cultures of North and Central America, including mushrooms in Veracruz; Caribbean literature in Michigan; high-tech farmers in Iowa; and all of the metaphors in-between.

Dr. Amy McFarland and I received support from the Brooks College of Interdisciplinary Studies and the Office of Undergraduate Research and Scholarship to complete this research. We also received support from GVSU Greek Life members who helped to plant over 100 fruit and nut trees at the Sustainable Agriculture Project (SAP) on Luce St.

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I. INTRODUCTION

> They were right when they sought to found a new educational system upon the University: where, forsooth, shall we ground knowledge save on the broadest and deepest knowledge? The roots of the tree, rather than the leaves, are the sources of its life; and from the dawn of history, from Academus to Cambridge, the culture of the University has been the broad foundation-stone on which is built the kindergarten's ABC. (Du Bois, 1961, p. 70)

There exists a grammar for the optimization of student experience and impact. And as with any language, this grammar consists of more than agency and voice. The vigilant student leader will recognize that language and patterns of engagement share characteristics at a more fundamental level. For example, both develop piecemeal: one may speak of how campus resources shape student activities and how, in turn, their adequate administration gives rise to patterns of community engagement and citizenship. Such patterns accumulate and structure the student experience, forming a *pattern language*. Alexander, Ishikawa and Silverstein (1977) elaborate:

> The elements of this language are entities called patterns. Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice. (p. x)

This is not to say that campus resources necessarily pose problems; these authors' discussion centers on how pattern languages inform the way we build rooms, gardens and houses. However, they also recognize the capacity of patterns to construct entire neighborhoods and other larger, connected environments:

> This is a fundamental view of the world. It says that when you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make it. (p. xiii)

By describing the patterns that have enriched my own experiences and engagements as a student of agriculture, I intend for this article to serve as an example of one pattern language. In addition to exploring its pedagogical implications with a notable degree of excitement, I also intend to demonstrate the metaphorical nature of these patterns. I thus examine the implications of language for community service learning through a number of essays, maps, and a preliminary investigation on environmental pedagogy.

The reader will recall that this is a matter of language. And, as with global languages, patterns and expressions may be fashionable for a time before going out of style. This grammar of proportioning resources, and how it structures our restorative actions across the landscape, is crucial. However, no standard remediation exists independent of ecological context. Actions speak louder than words, and one communicates much through their use of resources. So please take the time to consider your language and the worlds it allows you to engage and, with any persistence, *to build*.

II. LANGUAGE: GRAMMAR AND METAPHOR

a. Grammar

According to theories in cognition, a language is a collection of symbols and rules for combining these symbols, which can be used to create an infinite variety of messages (Reed, 2006, p. 244). In addition to being symbolic and generative (capable of forming an infinite number of combinations), languages entail a structure for production—the grammatical "rules" to which its symbolic combinations are subject. The grammar of any given language determines its linguistic patterns.

But rules are meant to be broken. Klammer, Schulz and Della Volpe (2007) explain that "the grammarian's rules are not necessarily laws that the language obeys. They are merely hypotheses, imperfect and incomplete at best" (p. 3). And they do not merely deal with word order. One's stored entries of words (lexicon) and the meanings they express (semantics) are just two sub-systems of language; formation of words (morphology) and phrases and sentences (syntax), in addition to sound patterns (phonology), are the other principal parts of a language.

So, where does this grammar come from? The Sapir-Whorf Hypothesis, as articulated by Edward Sapir and his student Benjamin Lee Whorf, contended that different combinations of linguistic symbols, sounds and rules generate unique ways of perceiving reality. Postman & Weingartner (1969) explain (p. 101):

> [Sapir and Whorf] believed that we are imprisoned, so to speak, in a house of language. We try to assess what is outside the house from our position within it.

> However, the house is "oddly" shaped (and no one knows precisely what a "normal" shape would be). There is a limited number of windows. The windows are tinted and are at odd angles. We have no choice but to see what the structure of the house permits us to see.

This theory, also known as linguistic relativity, seems to frame language and cognition as a chicken-or-egg conundrum: does cognition give rise to linguistic forms, or does language itself determine conceptual capacities? Sapir and Whorf claimed the latter. And, lest it become an abstract rabbit hole, one must acknowledge the positive impact this theory had on enlivening the discussion about grammar and cognition.

b. Conceptual metaphor theory

Work in cognitive linguistics has provided interesting food for thought. Lakoff & Johnson (1980b) greatly impacted the course of philosophical and psychological inquiries into language and cognition when they posited in *Metaphors We Live By* that our conceptual system is fundamentally metaphorical. They approached *metaphorical concepts* as those which we understand and structure in terms of other concepts, and *nonmetaphorical concepts* as those emerging directly from experience and thus defined in their own terms (1980a). They suggested that metaphorical language reflects our activities in the world and, in turn, our mental concepts of those activities. This indirect link between our conceptual system and language led them to determine that metaphor structures what how we navigate, interact with and perceive the world.

In an effort to validate their stance, Lakoff and Johnson discussed the metaphor ARGUMENT IS WAR (1980b, p. 4):

> Your claims are *indefensible*;
> He *attacked every weak point* in my argument;
> His criticisms were *right on target*;
> I *demolished* his argument;

They contend that this paradigm case demonstrates how arguments are partially structured by the concept of war. The metaphor ARGUMENT IS WAR, they say, represents a metaphorical mapping across conceptual domains.[1] Lakoff and Johnson's rough schema of concepts reveals three types of

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[1]Lakoff and Johnson speak of metaphors in the formula [TARGET] IS [SOURCE], with slight modifications to the copula verb 'be'. In this case, the *target* is the unfamiliar or abstract concept (ARGUMENT) and the *source* a more familiar or concrete concept (WAR). Theories in philosophy may describe the concept ARGUMENT as the metaphors *tenor* and WAR its *vehicle*.

metaphor: orientational, ontological, and structural. Orientational metaphors structure concepts linearly with nonmetaphorical concepts, and seem to directly reflect our perception of the physical environment. For example, the authors deduced the metaphor GOOD IS UP from the following linguistic expressions, widespread in everyday speech (p. 196-197):

> Things are looking up. We hit a peak last year, but it's been going downhill ever since. Things are at an all-time low. The quality of life is high these days.

The authors go on to give examples of ontological metaphors (e.g., THE MIND IS A MACHINE: *We're still trying to grind out the solution to this equation; My mind just isn't operating today; Boy the wheels are turning now!*) and structural metaphors (e.g., UNDERSTANDING IS SEEING: *I see what you're saying; It looks different from my point of view; What is your outlook on that?*).

Each type of metaphor may have subcategorization relationships. These metaphors, in combination, form a single system based on entailment relationships, though they are usually characterized by the "most specific" metaphorical concept. Lakoff and Johnson (1980b) show that we conceive of time as money, and that the TIME IS MONEY metaphor entails TIME IS A RESOURCE—we may *use* or *run out of* time—and TIME IS A VALUABLE COMMODITY—we can *give* or *thank one for* their time (p. 8-9). Of course, one cannot get their time back once they have spent it, nor do there exist time banks. These entailments simply highlight the systematicity of metaphorical concepts. Furthermore, they endow metaphors with the ability to highlight or hide the concepts they do or do not entail. For example, argument is war highlights the adversarial nature of argument but hides the fact that argument often involves an ordered and organized development of a particular topic (Evans & Green, 2006). The authors of conceptual metaphor also recognized this, and suggested the utopian state in which arguments are structured as DANCES.

The authors claim that metaphors serve a more fundamental purpose beyond rhetoric and stylistic enrichment. Indeed, "no single, concrete, nonmetaphorical concept is ever structured…to completely and precisely define any single abstract concept" (p. 198). More than speaking of abstract concepts—THE MIND, IDEAS and CULTURE—in more tangible terms—PHYSICAL SPACE and MOTION—we actually *think* in these metaphorical terms. In other words, our vast conceptual system appears to be fundamentally metaphorical.

Although metaphor may be a pervasive and comparatively unreflective aspect of daily language, it does not necessarily follow that it plays such a fundamental cognitive role so as to influence the human conceptual structure. In fact, conceptual metaphor theory has been subject to skepticism and vigorous debate since its conception, namely in the fields of philosophy, psychology, and linguistics (Camp, 2006; Carston, 2014). Camp (2006) levels a valid point against conceptual metaphor theory (p. 159):

> [Lakoff and Johnson are] most interested in establishing the metaphorical nature of ordinary thought about familiar matters like arguments or anger. […] The class of metaphors for which this hypothesis is most compelling is the spatial representation of relatively abstract domains. […] However, … our experiences of [abstract] topics are at least as embodied and concrete, and are accessible at least as early in life, as our experiences of the domains in whose terms we characterize them metaphorically.

Evans and Green (2006) agree that abstract target concepts often lack the kind of perceptual basis which characterizes the source concepts, but that it is not so straightforward. CHANGE, for instance, can be detected in any number of domains, including non-physical ones (e.g., a change in the emotional tone of a conversation), whereas the detection of physical MOTION is directly based on physical perception (p. 305).

Empirical research in psycholinguistics has revolved around whether metaphor comprehension is "direct" or "indirect", whether or not hearers seek metaphorical interpretations only after the literal meaning fails. Camp (2006) again cites a number of investigations that suggest interpretations arise automatically, and not only after the failure of a literal interpretation. Tourangeau and Rips (1991), in their clinical trial of metaphor comprehension, give a more concise synopsis of the these so-called reaction time studies: "if this two-stage comprehension model is correct, metaphors should take longer to interpret than literal sentences; in fact, the evidence suggests that metaphors are understood just as quickly as literal sentences" (p. 454).

The mapping model of Lakoff and Johnson is not the only one to receive intrigue in the scientific community. Tourangeau and Rips (1991) discuss Ortony's (1979) salience imbalance model, which contends that there must be some degree of asymmetry between the domains to successfully map the source domain (WAR) onto the target domain (ARGUMENTS), and which seems to be in line with Lakoff and Johnsons' argument. However, Camp (2006) believes that the "relevant asymmetry" that services this metaphorical mapping is not clear-cut: our experiences with relatively abstract concepts (e.g., ARGUMENTS) are "at least as embodied and concrete, and are accessible at least as early in life, as our experiences in the domains in whose terms we characterize them metaphorically" (p. 159). She addresses ARGUMENT IS WAR: "I've been in many arguments, but I have only very little, very indirect experience with war; and that experience is itself quite unconnected to the highly strategic aspects of war that underwrite metaphorical descriptions of arguments" (p. 159). Tourangeau and Rips (1991) also discuss the theory of Gentner and Clement (1989) as one broader than domain asymmetries. By leveraging the predicates of grammatical structures (i.e., phrases containing verbs), one is able to create "a mapping of knowledge from one domain (the 'base') into another (the 'target') which conveys that a system of relations that holds among the base objects also holds among the target objects" (p. 453).

c. Ecolinguistics

I have chosen a more simple approach to metaphor as articulated by Dr. Arran Stibbe in *Ecolinguistics* (2015), wherein metaphors "use a frame from a specific, concrete and imaginable area of life to structure how a clearly distinct area of life is conceptualized" (p. 64). This definition of metaphor makes use of the 'frame', which is essentially a domain or tenor-vehicle designation according to other theories. Furthermore, its critical applications extend to the literary; it encompasses not merely facts, but also the value priorities and ecological considerations that give rise to "stories-we-live-by". These 'stories' are mental models within the mind of individuals, and the 'stories-we-live-by' are those in the minds of multiple individuals across a culture (Stibbe, p. 6). He elaborates:

> The stories are important because they influence how individuals think, and if they are spread widely across a culture then they can become stories-we-live-by and influence prevailing modes of thought in the whole society. (p. 16)

Stibbe (2015) notes that certain texts may forge and perpetuate ecologically destructive stories-we-live-by, or contrarily they may challenge them and provide new stories that we *could* live by (p. 17). As language is the mechanism by which stories are transmitting across generations and across cultures, it is a potential point of intervention.

These 'texts' are written materials that reflect our daily linguistic activities. However, there are other culturally relevant practices which transmit the mental models we live by, and which we can more actively engage. Agriculture is one such practice. The agricultural stories-we-live-by, and especially those which comprise restoration agriculture, are innovative and extensive, from Richard Perkins in Sweden and Darren Doherty in Australia; to Sepp Holzer in Austria and Peter Allen in Wisconsin; and even to Grand Valley State University in Michigan, as we shall see.

I should note that I do not entirely subscribe to the 'ecosophy' of Stibbe's Ecolinguistics. However, I do like the idea of prolonged interaction with and documentation of any given language and its environmental patterns of engagement. Louis-Jean Calvet (2006) notes that Einar Haugen was the first to use the phrase 'ecology of language' in a broader sense.[2] Whereas Calvet uses the term 'ecology' to describe and make salient the relationships between world languages, I intend to examine the metaphors of farmers—many of which deal with ecological systems—to glean basic linguistic patterns and investigate their utility as a pedagogical tool. To this end, we must first examine sustainable agriculture.

III. AGRICULTURE

For time unknown, nomadic tribes showed controlled parts of their landscape, selectively managing its health and quality by selective burning. Flames rose through dense tree canopies that hosted, at every turn, ecosystems. The functions of these ecosystems, to the extent that our ancestors knew much of them, have slowly made their way out of lay cognizance. One such function is the production of food.

Nearly 10,000 years ago, these tribes responded to increasing population pressures by developing agricultural-based societies in which they promoted the growth of certain food plants while suppressing other species. These activities occur on and in the soil; however, soil is not merely a medium for plant growth, but also provides many additional ecological functions. These functions, also called ecosystem services, are the products of natural systems that support and fulfill human needs (**Figure 1**).

[2] "'Linguists have generally been too eager to get on with the phonology, grammar, and lexicon to pay more than superficial attention to what I would like to call the 'ecology of language', he wrote, adding: 'Language ecology may be defined as the study of interactions between any given language and its environment'" (Calvet, 2006, p. 9).

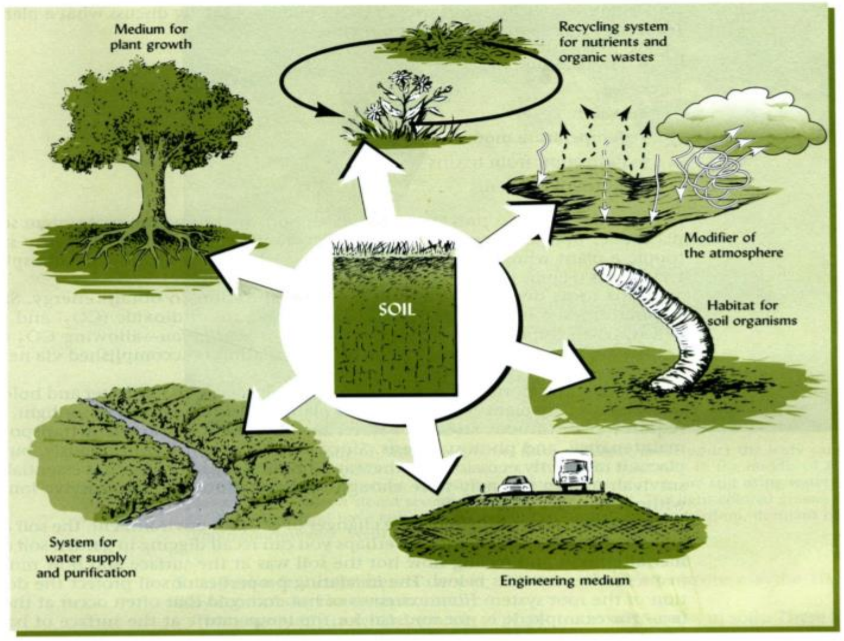

Figure 1. The many functions of soil can be grouped into six crucial ecological roles (Brady & Well, 2008, p. 3).

Although *homo sapiens* seems to have afforded itself a developmental advantage as a result of exerting continuous control over the soils—even entire ecosystems—, the consequence is oftentimes the utter collapse of civilization. Indeed, the decomposition of the organic matter in U.S. prairies, the degradation of the soil is perhaps the most obvious and egregious resource concern in the world.

Agricultural activities over these millennia offer crucial insights to culturally-specific methods of engaging the land and its rich resources contained in the vast world of soil. Mark Shepard details the beginnings of agriculture as centered on the production of annual crops—that is, crops that grow for one season, produce seeds, and wither away. These crops, which take root in uncountable acreage of monocultures across the globe, tend to include a mixture of the three staple food crops: carbohydrates (grasses), proteins (legumes) and oils.

One of the issues with annual crops is that, "by their nature, [they] require exposed soil to grow" (Shepard, 2013, p. xviii). In other words, annual vegetable production requires disturbance. In large-scale, conventional agriculture systems, a farmer will not likely wait for floods, landslides, fire, trampling, wind events or erosion events to expose their soil; they will instead employ the plow. Tillage is the "mechanical manipulation of soil" for any purpose (Brady & Well, 2008). While there are many styles of tillage (**Figure 2**), all are used to disturb the soil surface for crop establishment.

Figure 2. (*Left*) In conventional tillage, a moldboard plow inverts the upper soil horizon, burying all plant residues and producing a bare soil surface. (*Right*) A chisel plow, one type of conservation tillage implement, stirs the soil but leaves a good deal of the crop residues on the soil surface (Brady & Well, 2008, p. 763; Photos courtesy of R. Weil).

The ability to till nearly every square foot of immense swaths of land has exponentially increased over the years, starting with the hoe, then advancing to the horse, and now with the help of tractors.[3] Since the introduction of mechanized agriculture, farmers have by and large used the moldboard plow to this end, lifting and flipping the upper layer of the soil, rich in organic matter and innumerable soil organisms, on its head. This, in turn, exposes and invites microorganisms to oxidize nutrients and organic matter, and immediately boosts plant establishment and initial growth. However, tillage systems, whether conventional or of the conservation school of thought, inevitably entail increased rates of soil erosion. As J. Russell Smith (1929) put it, "Forest—field—plow—desert—that is the cycle of the hills under most plow agricultures" (p. 4). Indeed, the dreary beginnings of agrarian societies have been marked by immense losses of productive topsoil.

However, things need not be so drab. In fact, many agriculturalists and agrarians the world over are now opting not merely to conserve and maintain their soil resources, but rather to increase and improve their landscapes. In other words, the mindset of sustainable agriculture is switching from one of extraction and depletion to one of replenishing and restoring fertility to land. Nature is a resilient producer, even in the most dire of circumstances, and its (or her) patterns have given rise to "evolving, adaptive management regimes" the world over (Dewar, 18).

The name of the game is perennial polyculture, or the cultivation of a variety of woody species. In line with the staple

[3] Tillage has not occurred to the same degree for 10,000 years since the beginnings of agriculture; there is a difference between plowing an entire field, and precisely locating productive areas for selective sowing.

food crops listed above, many farmers have established such productive systems. Mark Shepard, Ben Falk, Sepp Holzer, Michael Phillips, Grant Schultz, Richard Perkins and Darren Doherty are among the men who have engaged this type of farming. Climate permitting, they have planted Chestnuts to replace corn, and hazelnuts to replace soy. They have participated in large-scale earthworks, investing in bulldozers to move land once in order to avoid irrigation costs for centuries. And they have shared their sustainable practices with the world through various platforms, including books, webinars, workshops and Facebook posts.

These sustainable practices, in their purest concentration, are by and large a set of metaphorical principles. For example, in order to prevent erosion one must cover the soil and thus sow any number of 'cover crops'. This covering action that we may employ across the landscape allows us to conceive of covers as BLANKETS, a concept that fits well when it comes to reciprocating care to our anthropomorphized Mother Nature. As these practices accumulate into a strong, systematic web of productivity, one might examine their metaphorical basis before applying them to tropical or temperate systems: AGGREGATION IS BUILDING, whereas DECOMPOSITION IS DECONSTRUCTION.

It appears that these metaphors have the potential to become incredibly powerful pedagogical tools with regard to sustainable agriculture. Let us consider a few examples of TILTH[4] IS HEALTH and AGRICULTURE IS CONSTRUCTION (my emphasis):

> Then, having determined what is wrong, a course of **treatment** must be planned which will arrest the **destructive** erosion and bring the lands back to the most productive condition possible. Erosion-resisting or **soil-building** crops may be needed. (USDA, 1954, p. 2)

> "Perennial vegetation is needed to **protect** the land during severe drought and to **rebuild** soil structure and fertility" (USDA, 1954, p. 38).

> Soil-Depleting, Soil-Conserving, and **Soil-Building** Crops." (Section title, USDA, 1954, p. 121)

> The **destruction** of organic matter is brought about by a process of oxidation through the action of micro-organisms, aided by aeration of the soil following cultivation. (USDA, 1954, p. 122-123)

> It is usually necessary to move down the ecological scale to the more primitive species, and, gradually **build** the site back toward its **virgin** condition. (USDA, 1954, p. 60)

[4] 'Tilth' is essentially

> Longtime rotations including **soil-building** legumes and grasses are in some places difficult to follow in a semiarid climate. (USDA, 1954, p. 36)

> The primary purpose of soil and water conservation is to prevent soil erosion and **heal** its **scars** where it has not advanced too far to respond to curative methods. (USDA, 1954, p. 1)

> Whether this soil wastage is to be allowed to continue rests with the landowners and producers and consumers of foodstuffs, and with the soil conservationists, agronomists, geologists, foresters, engineers, and others who may be called in to help **prescribe** a **cure** and carry on the **treatment**. (USDA, 1954, p. 21).

> Under natural, healthy conditions in humid areas, the land is **clothed** with grass, shrubs, trees, or other vegetation. (USDA, 1954, p. 49)

> Weeds play their part in **building soil fertility** and in balancing the biological community. (Fukuoka, 1992, p. 34)

> People interfere with nature, and, try as they may, they cannot **heal** the resulting **wounds**. (Fukuoka, 1992, p. 34).

> The mechanics of the process of soil development whereby Nature **built up** the great fertile soil belts of the earth are now reasonably well understood by the farmers. Good writers have made of the process an absorbing and fascinating story. Some see in it a miraculous efficiency and give estimates of the time required to **build** one inch of fertile soil--varying from a few hundred years to ten thousand. (Yeomans, 1954, p. 18).

> When this happens plant roots have nothing to gain by penetrating this **dead** soil. These are all vital factors in maintaining and building soil fertility. (Yeomans, 1954, p. 20).

> Instead, **build** better soil structure, improve soil fertility, make, manufacture and create deeper, more fertile soil just by providing soil with the capacity to absorb fertility. (Yeomans, 1954, p. 67).

> The cheap storage and transportation of water, over long distances, are usually the life blood of a successful gold mine, and Yeomans became convinced it could be the **life blood** of a successful farm in Australia. (Yeomans, 1954, p. 5).

> If the valley is eroded the erosion holes will continue to bleed moisture to the atmosphere until little remains. (Yeomans, 1954, p. 52).

The soil is clearly something that we can consider a living thing, albeit moreso an orchestra than a soloist. It is likewise subject to the constructive whim of its foremen, those who impose blueprints of productivity for a better world.

Although these principles are relatively universal, the farmer must also consider, for example, the climate in which their plants can grow and the extent to which their social context allows for the creation of an economical enterprise. Let us now consider the Laker context.

IV. GRAND VALLEY STATE UNIVERSITY

a. Bioregional Assessment

By distinguishing between continent and subcontinent-sized areas as ‘realms’, which are then divided into ‘provinces’, Uvardy (1975) created a unified system for biogeographical and conservation purposes. His designations provide a bioregional gradient that helps both to determine the context in which communities carry out their ecological functions, and to further examines its respective patterns.

Michigan falls within the Nearctic realm, which encompasses much of North America and its shelf islands. Embedded in the Nearctic realm is the Great Lakes Biogeographical Province, which includes the state of Michigan. This area, which is described as Eastern Forest, is situated south of the Canadian taiga, and north of the humid Austroriparian Province of Florida (**Figure 3**). Zooming in to West Michigan, the counties of Kent and Ottawa include the Pew and Allendale campuses of Grand Valley State University, which are both part of the Lower Grand River Watershed (**Figure 4**).

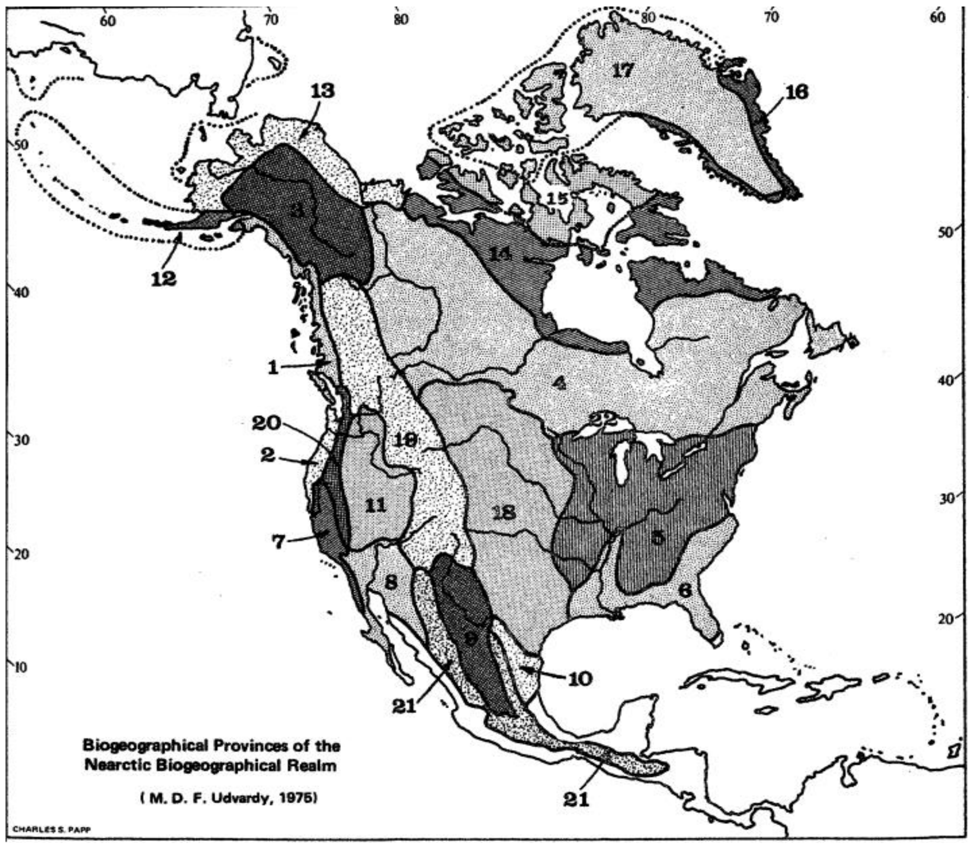

Figure 3. From Uvardy (1975).

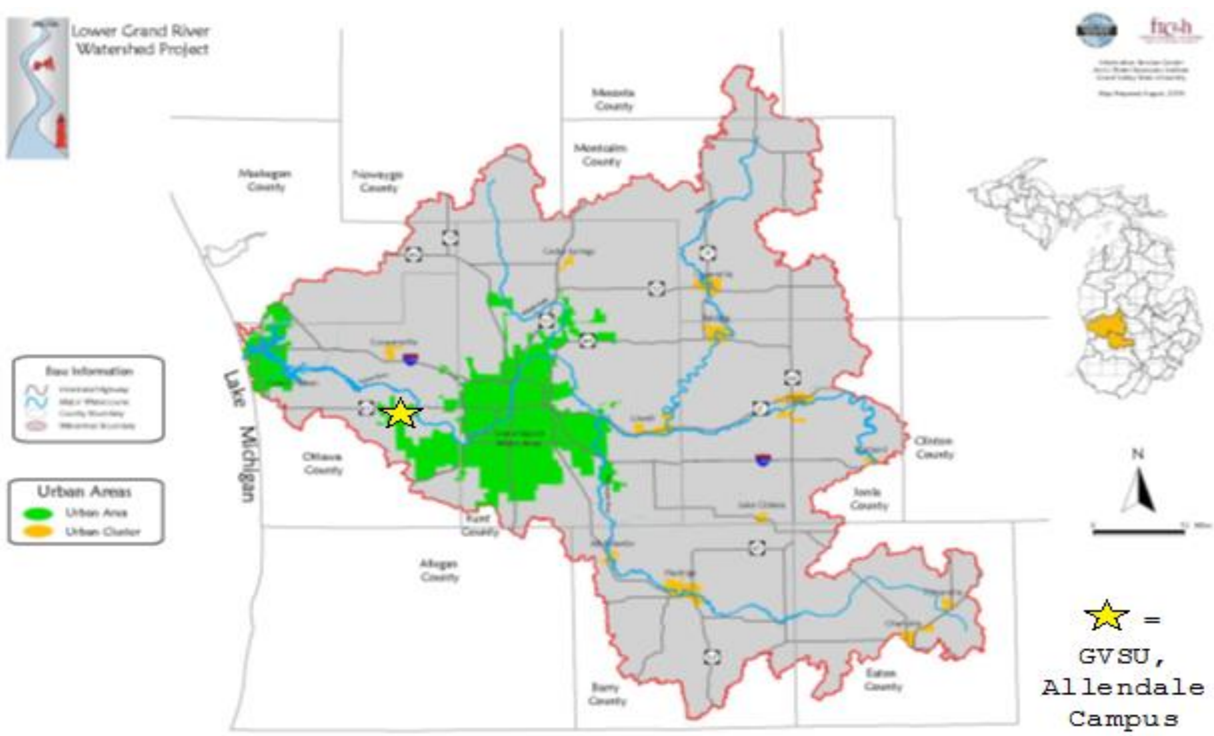

Figure 4. The Lower Grand River Watershed. Grand Valley State University, Allendale Campus is marked by a star (original map by FTCH, p. 22).

These designations provide a 'big picture', so to speak, of the ecological possibilities of West Michigan, and specifically Grand Valley State University. These designations are crucial for determining ecological context, and thus productive capacity in terms of education and material goods, among the many other ecosystem services. The intended result of understanding local ecology is, in the Laker context, to implement effective sustainability programs at the University.

b. Sustainable practices of GVSU

GVSU is a leader in sustainable practices, both regionally and nationally. The University uses the Brundtland Commission's definition of 'sustainability' as "meeting the needs of today without compromising the ability of future generations to meet their own needs," the impact of which is social, environmental and economic (GVSU, 2015, p. 2). To this end, the university has been engaged in a number of sustainable practices. As the Office of Sustainability Practices has outlined in its "Collective Sustainability Impact Report" (2015), the University has invested in the following areas of sustainability programming (p. 3):

1. Education for Sustainable Development
2. Sustainable Food Systems
3. Waste Minimization
4. Energy Conservation and Management
5. Water Conservation and Management
6. Alternative Transportation and Fuels
7. Sustainable and Local Purchasing
8. Fiscal Sustainability
9. Health, Wellness, and Nutrition
10. Sustainable Building and Land Use
11. Community Engagement and Service

In my estimation, the first and last of these areas—education and community engagement—are those that most commonly enable students to interact with the resources of GVSU, both on campus and in the community; whereas the other areas comprise domains or systems to which increased student engagements may greatly contribute. Let us consider Water Conservation and Management at GVSU.

Most who have strolled through the university's campus arboretum have eventually come to look out over the beautifully complex system of ravines that eventually leads to the Grand River. In the estimation of Dr. Peter Wampler of Geology, the ravines represents "an oasis of topographic relief in an otherwise flat landscape" (2010 p. 26). In the same issue, Dr. Colgan outlined "A Brief Geologic History of the Ravines," where he started by noting the definition of 'ravine': "a small valley, usually carved by running water; esp. the narrow excavated valley of a mountain stream" (p. 11). I can think of no resource concern more fundamental to the identity of GVSU Lakers.

The GVSU water management regime is principally concerned with the reduction of water consumption (GVSU, 2015 p. 8). This makes sense in terms of managing the systems already in place on campus: whether washing dishes at Campus Dining locations; irrigating the Meadows Golf Course; or providing student residence halls with water for hydration and hygiene, there is much potential to reduce water consumption.

However, the sustainability measures of the University often lack direct mention of the ecological systems that allow for the collection and storage its water resources. It is important to note that the ecological functions of water collection and storage necessarily occur before the installation of, for example, low flow toilets and showerheads that aim to reduce water consumption.

An outstanding exception is the Storm Water Management Complex. In 2012, a faculty and staff member research study in collaborated with Facilities Planning Department, made efforts to monitor the recently installed detention pond system between the west side of Allendale campus and its complex of off campus apartments. The result report, titled "Storm Water Management Complex 2012 Monitoring Final Report", was published one year later (Wampler & Kneeshaw, 2013). This report built upon earlier work by Fishbeck, Thompson, Car & Huber, Inc. (2004) and Wampler (2010), which pointed out that institutional runoff levels had increased up to a thousand percent between the 1950s. Other work by students has also done well to analyze and report on institutional resource use, such as Youssef Darwich and Dana Eardleys' (2015) handbook for sustainable practices at GVSU.

These examples show that Grand Valley is making clear efforts to engage sustainable practices at the institutional level while empowering students to participate in project implementation and monitoring. However, as I mentioned above, the university's sustainability goals are to slow or even *prevent* the loss of natural resources, such as erosion. An alternative approach would be to *increase* natural resources and their provisioning. To this end, I have designed a research project that centers on the planting of trees.

V. SAP PLACE-BASED GRANT

My project was to incorporate some of this sustainable thinking at the institutional level and develop a pedagogy that reflects the university's goals while advancing them. By leveraging the metaphorical language of sustainable agriculture practices, I hope to develop a pedagogy for all disciplines. I contend that the necessarily active role played by the student learning experientially, and who is engaged in "construction", for example, may promote a positive change in their environment, even if they do not know much about construction. The Sustainable Agriculture Project was the best place to engage this research.

a. THE SUSTAINABLE AGRICULTURE PROJECT

The Sustainable Agriculture Project (SAP) is a student-run, multi-functional space located at the Wesley House, less than one mile south-west of the Allendale main campus.[5] The project began in 2008, following the installation of an intricate garden by Environmental Studies students. Nearly one decade later, and now under the purview of Brooks College of Interdisciplinary Studies, the SAP has greatly expanded its scope of activity.

Darwich and Eardley (2015) created a Handbook as part of their Senior Project that details the history and organizational structure of the SAP, including production techniques and ideas for its "future growth" (p. 2). They intended for the document to be iterative—a living document that requires on-going refinement.

The 40-acre parcel that immediately encompasses the SAP, for those that have taken the time to observe its land dynamics throughout the academic year, provides a quintessential case study for conservation efforts. Principally composed of "crop land" leased out annually to conventional farming, one of the fundamental resource concern is soil erosion (NRCS, 2012). The administration has, to some degree, sought to address this issue with the introduction of a new Farm Manager position.

The Mission Statement of the SAP includes the following four items (GVSU, 2017a):

1. Seeding sustainable food practices
2. Cultivating leadership and learning
3. Nurturing place
4. Growing community

The metaphorical nature of each item is clear. What is not as immediately clear is the ability of this language to foster interdisciplinary communication: although we cannot literally grow a community, we must not be farmers to do so.

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[5] Located on Luce Street, the SAP is technically still part of campus. This is not immediately obvious, as the University annually leases the surrounding property to corn and soy production.

Given past and present efforts to manage university resources, student and faculty stakeholders have taken it upon themselves to actively intervene in the evolution of productive soils. Through a SAP Place-Based Grant and the help of a diverse array of student volunteers, the project organized for the purchase and planting of over 100 fruit and nut trees, in addition to original scholarship. The following report provides the rationale and theoretical underpinnings of the undertaking.

b. My Experiment

Introduction

The purpose of the project was to investigate student attitudes toward experiential learning. Experiential here simply entails "hands-on" participation. The logic of the study was simple. We presented two linguistically divergent narratives to participant groups, and in turn analyzed and compared responses about their experiences.

Methods. Perhaps more so than meaning-making, actually comprehending sentences indeed depends upon semantic context (Carston, 2014; Reed, 2006). For this reason, I created a narrative that embedded a number metaphors of natural resources management to test whether or not subjects could, in turn, reason by analogy about practices in sustainable and regenerative agriculture. I performed discourse analysis on the free response questions by analyzing verbal phrases and predicates.[6]

Subjects. We recruited two organizations from GVSU Greek Life to participate in October tree planting events at the Sustainable Agriculture Project (SAP). These organizations provided ideal candidate pools because of aptness to community service and proximity to the planting site. Most participants had never before visited the SAP, and some had not known of its existence. By exposing the unacquainted, we were able to more flexibly communicate the nuances and plans for growth that are part of the actual SAP narrative (Darwich & Eardley, 2015; Darwich, 2015).

Tree Planting. The Farm Manager briefly instructed participants on SAP management techniques and practices, such as fruit tree grafting, the nature of root stocks, and the safe transportation of trees from nursery. With rows already tilled and staked (see **Figure 6** for area of interest), each student completed at least one of the following tasks:

- extend paper mulch across unplanted tree rows;

[6] Ekaterina (2015) noted that upwards of 68% of corpus data on metaphor in educational discourse was accounted for by verbs. Tourangeau and Rips (1991) also effectively analyzed metaphorical predicates and their features. Some analysis was limited when subjects responded with simple noun phrases.

- place saplings along rows in apple-chestnut-plum pattern;
- loosen and flip soil aggregates atop edges of paper mulch;
- make centered perforations in paper mulch at 10-ft. spacing;
- remove saplings from burlap and plant;
- lightly cover tree openings with topsoil; and
- transport and apply wood-chip mulch via wheelbarrow.

These tasks ensured tree establishment without the need for intensive management through the subsequent season. After this time period, however, management will require more attention. Snell (2015) addresses most of these management concerns in a Laker context. After planting trees, I led a team of GIS students and the Farm Manager to document tree metadata (**Figures 7 & 8**). This data will allow stakeholders to conceptualize site restoration and management.

Experiment I: Knowledge of Agriculture

Survey. Before the tree planting, participants listened to one of two scripts (see below). They next completed free-response surveys regarding their knowledge of agriculture and natural resources management. This survey included the following questions as adapted from Sitienei (2011):

- What did you learn about soils?
- How do trees effect soil erosion?
- What are some inputs in agricultural systems?
- How can we manage water in agricultural systems?
- What role can you play with farms in your community?

Following tree planting treatments, participants once more completed the same survey.

Scripts. With the help of the SAP Farm Manager, I encoded SAP development and production goals into two short narratives After the initial survey, participant groups gathered in a circle, and I read their respective script aloud. I compiled the scripts by sampling from two extended metaphors in sustainable agriculture: TILTH IS HEALTH and AGGREGATION IS BUILDING. The metaphor group (n = 15) experienced metaphorical language, whereas the technical group (n = 5) listened to a narrative written in a far more technical register. The content of the scripts was identical, save for the substitution of choice noun phrases and verb phrases (**Figure 5; Table 1**).

Introduction[1]

Hello, volunteers! We are excited to work with so many exceptional Lakers, and we thank you for joining us to plant trees at the Sustainable Agriculture Project. Before we begin, it will be of great use to review our to-do list, including short- and long-term goals for restoring the soils to be a productive part of GVSU land.

Script, metaphorical (10/08/2016)

Today, you all have chosen to participate in one of the most important natural **constructions** of the university. You have all come out to help in **doctoring** the **sick** soils that are part of the university property. A little erosion is permissible; however, the **surface cuts** of the site have dramatically deepened, and the health of the land is **bleeding away** due to the erosive forces of nature. The aim of this project is to restore the **poor** soils of the site. By **constructing** an ecologically conscious and resilient **infrastructure pattern**, we can **invest** in the **soil banks** and passively **enrich** them.

We have the opportunity to **construct** nature and **set the foundations** for an incredibly beneficial food forest by simply planting fruit- and nut-bearing trees. Once trees are planted, their roots will grow strong and **grip and hold the soil**. By giving the land a **chiropractic** adjustment and realigning its structure in a healthy way, we are **protecting** nutrients from the erosive elements that would otherwise **carry** them **away**. Finally, we will **blanket** the trees with mulch to protect against the **water-stealing** effects of the sun.

I animate you have fun as you make use of the resources at hand. Remember that as we **lay biological bricks** today, we are working toward the completion of a Grand **blueprint** that will, in turn, create a healthy campus of future Lakers.

Script, technical (10/15/2016)

Today, you all have chosen to participate in one of the most important natural **developments** of the university. You have all come out to help in **restoring** the **nutrient-deficient** soils that are part of university property. A little erosion is permissible; however, the **eroded channels** of the SAP have deepened, and soil nutrients are **dispersing** due to the erosive forces of nature. The aim of this project is to restore the **nutrient-deficient** soils of the site. By **establishing** an ecologically conscious and resilient **design pattern**, we can **increase** the **soil microbiology** and **increase** soil fertility in a passive way.

We have the opportunity to **engage** nature and **develop the land** for an incredibly beneficial food forest by simply planting fruit- and nut-bearing trees. Once trees are planted, their roots will grow strong and **keep the soil in place**. By giving the land a **structural** adjustment and realigning its structure in a healthy way, we are **preserving** nutrients from the erosive elements that would otherwise **disintegrate** them. Finally, we will **cover** the trees with mulch to prevent against the **evaporative** effects of the sun.

I animate you have fun as you make use of the resources at hand. Remember that as we **plant trees** today, we are working toward the completion of a Grand **design** that will, in turn, create a healthy campus of future Lakers.

[1] Both scripts will make use of the same introduction.

Figure 5. The scripts are dated according to tree planting days. Bold words were metaphor-technical interchangeable.

METAPHOR	TECHNICAL
Construction (n)	Development
Doctor (v)	Restore
Sick (adj)	Nutrient-deficient
Surface cuts (n)	Eroded channels
Bleed away (v)	Disperse
Poor (adj)	Nutrient-deficient
Construct (v)	Establish
Infrastructure pattern (n)	Design pattern
Invest in (v)	Increase
Soil banks (n)	Soil microbiology
Construct (v)	Engage
Set the foundations (v)	Develop the land
Grip/hold (v)	Keep in place
Chiropractic (adj)	Structural
Protect (v)	Preserve
Carry away (v)	Disintegrate
Blanket (v)	Cover
Water-stealing effects (n)	Evaporative effects
Biological bricks (n)	Trees
Blueprint (n)	Design

Table 1. Phrases with nouns (n), verbs (v), and adjectives (adj) are listed with their synonyms or 'translations' between registers.

Results & Discussion. We anticipated the second survey to include linguistic elements that were part of the script treatments. Pre-survey responses included various degrees of understanding of erosion. Some metaphors found in the responses of both groups reflected erroneous thinking about erosion: "[trees] destroy the foundation"; "…they effect soil erosion by hardening the soil"; and "[trees] compact soil to prevent erosion." However, other responses demonstrated a more wholesome understanding: "roots keep the soil together"; "roots stabilize soil"; and "roots help soil stay down."

Note that the metaphors nearly disappear in these more accurate responses before script readings. One response did well to recognize the institutional context and the health metaphor at once: "The school left dense clay and the students were able to *revive* them." In addition to these metaphors, some responses appeared to be rather neutral—neither metaphorical nor technical: "[soils] can be fixed." Most of these responses are attributed to the metaphor group (n = 15). In the case of the technical group (n = 5), much metaphorical language occurred throughout pre-survey responses, including SOIL IS A CONTAINER ("you plant things **in** it") and SOIL IS ARCHITECTURE ("[soil] is the **foundation** for plants and flowers to grow"; italics mine).

Most of these pre-survey responses seem to be consistent with restoration agriculture and its practices, however post-survey responses were more articulate with regard to the effects of trees on soil erosion. Whereas the only mention of roots in the technical group had been incorrect, 5/5 of the follow-up responses successfully mentioned the power of tree roots in gripping the soil and preventing erosion. Likewise, pre-survey responses about water management included scattered mention of irrigation, whereas post-survey answers listed mulch, trenches, tree roots and

It is difficult to build upon the metaphorical practices of sustainable agriculture in such a way that the whim of the linguistically savvy not be led astray and translate truly damaging practices into those considered sustainable. Indeed, the following post-survey response demonstrates that the pedagogy was not entirely successful: "Soils need trees to cement in the water so it doesn't flood." We cannot say that the metaphorical and technical groups experienced agriculture in the same registers of their respective scripts. For example, two of the most outstanding uses of metaphor were in the technical group post-survey, with respondents noting of erosion that "the roots…act like a glue," and that effective water management could occur if the manager "put the mulch like blankets over the soil."

Indeed, one cannot restrict language. As the Farm Manager and I responded to student questions about erosion, for example, we both made use of such metaphorical language as "the mulch will blanket the tree line" and "roots hold and glue soil together." In the same way, we likely explained these concepts to the metaphor group using technical terms. Context demands the form of explanation, and that there is oftentimes none better, be it technical or metaphorical, that allows diverse groups of students immediate access to the concepts of sustainable agriculture.

Part II. Attitudes toward experiential learning

Survey. In addition to completing the free response section for the second time, participants were asked to rate their experience. They did so after the tree planting treatments by responding to ten statements on a 1-5 Likert-type scale (Likert, 1967). The final survey included covered the following positive connotation statements as adapted from Waliczek and Zajicek (2010):

- I learned to apply new principles from this activity to new situations.
- I developed a set of overall values in agriculture through this activity.

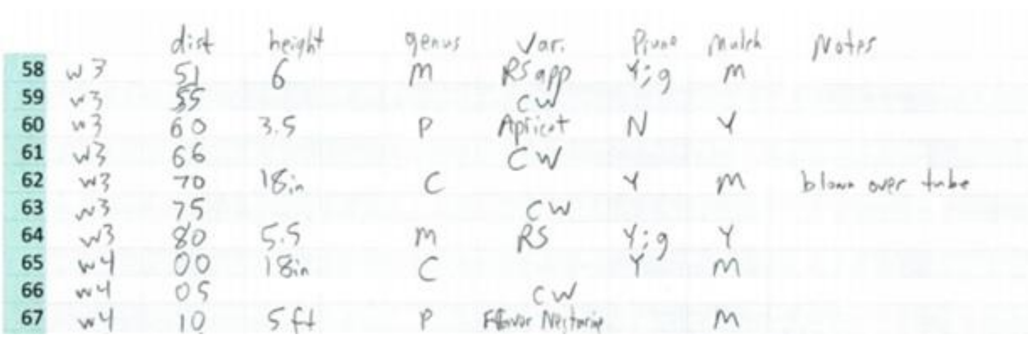
- I developed a greater awareness of societal problems from agriculture.
- I reconsidered many of my former attitudes about agriculture.
- I developed a greater sense of personal responsibility in agriculture.
- I deepened my interest in agriculture.

- I learned a great deal from this activity.
- I felt that my experiences gained through this activity will be beneficial to me when I graduate and start working in my chosen field.
- I would recommend that all students complete a service learning project at the SAP.
- I feel that I performed up to my potential in this activity.

Results & Discussion. We expected students to rate their attitudes toward the experiential learning opportunity as positive. Student responses were indeed *extremely* positive: the mean for the metaphor group was 43.5 ($SD = 3.48$) and the mean for the technical group 46.8 ($SD = 2.59$). Although there was no significant difference ($p > 0.05$) between the metaphor group and the technical group, this is not necessarily a bad thing for the pedagogy; it indicates that the student groups felt similarly positive regarding their experience at the SAP.

Figure 6. Project area of interest, outlined.

Figure 7. GIS students and Farm Manager collecting tree metadata.



		dist	height	genus	Var.	Prune	mulch	Notes
58	w3	51	6	m	RS app	Y;g	m	
59	w3	55			CW			
60	w3	60	3.5	P	Apricot	N	Y	
61	w3	66			CW			
62	w3	70	18in	C		Y	m	blown over tube
63	w3	75			CW			
64	w3	80	5.5	m	RS	Y;g	Y	
65	w4	00	18in	C		Y	M	
66	w4	05			CW			
67	w4	10	5ft	P	Nectarine		M	

Figure 8. Samples of data orchard data. Students organized data by field ('w' for 'west') and distance from the beginning of each row. Genus varied between Prunus (Apricot, Peach, Cherry and Nectarine), Malus (rootstock apple) and Castanea (Chestnut). 'CW' stands for inter-plantings of Cottonwood.

VI. Conclusion

Interestingly enough, my interest in conceptual metaphor theory is not a direct connection to learning about sustainable agriculture, but rather a means to promoting interdisciplinary communication. To this end, I intended to begin articulating its pedagogical applications for soil science.

In line with the Sapir-Whorf hypothesis, Postman & Weingartner (1969) speculated in Teaching as a Subversive Activity that "what we perceive, and therefore can learn, is a function of our language process" (p. 101). Though written over fifty years ago, their pedagogical approaches are still hold relevance, especially for the secondary and post-secondary levels. I combined their theory with that of conceptual metaphor while attempting to test its effectiveness empirically.

The overall success of the tree planting program demonstrated the great impact of interdisciplinary communication upon institutional 'landscapes'. In the case of Grand Valley, we recruited service-oriented members of university organizations—especially Greek Life—to discover the foundations of sustainable agriculture practices, and simultaneously assist the University in its achieving Objective 3.4 of the GVSU 2010-2015 Strategic Plan,[7] which reads as follows:

> By 2015, service learning, co-curricular activities and other experiential learning opportunities are fully developed and supported by administrators, faculty, and students at Grand Valley as a pedagogy that links community service to academic coursework. (GVSU, 2017)

Language patterns are fashionable and may thus go out of style, so to speak. It is important to note that grammatical descriptions may be either descriptive or prescriptive. The former simply describes the operation of grammar systems, whereas the latter is concerned with governing according to what educated speakers consider appropriate, also known as a Standard. Perhaps the most fundamental pattern of my descriptive grammar is a preliminary understanding of ecological context. A mosaic of grammatical elements, ecology encourages the student to explore sub-patterns of engagement. Navigating the campus environ reveals niches that informs modes of engagement and leadership. Indeed, the institutional framework within which students operate entails salient commonalities that become clear upon examination. This especially is the case for incoming classes and returners navigating the campus environ, intent on collaborating across disciplines.

The constructive ambience of campus provides impetus to engage and manifest our patterns of production. In other words, patterns of experience become a toolset to manufacture change in one's community. As I mentioned earlier, this process requires that student leaders be equipped with more than hammer and nail.

It is a noble deed to participate in community service, the relevance of which increases for those students able to link it with their coursework. Yet, I believe that the pedagogy of metaphor accomplishes much more than that, if not in the case of my experiment. Tree planting links people to place: local ecology, syntheses and seasonal cycles. To this end, metaphor served as a tool not only for directly observing information, but for 'filtering' it. If one is having trouble grasping a new concept in

[7] The 2016-2020 Strategic Plan listed Sustainability as one of its Values, noting that "We provide our students with excellence in education for sustainable development by imbedding theory, systems-oriented thinking, and service learning into our curricular and extracurricular programs" (GVSU, 2017b).

a certain discipline, it may be that the concept has a different metaphorical structure, perhaps even in what seems to be direct opposition to the metaphorical nature of a related concept. To the degree that the students are cognizant of the metaphors through which they are approaching a discipline, they will have better recourse to determine the origin of their confusion. Whether or not this would fragment disciplines along the lines of conceptual camps is a different matter.

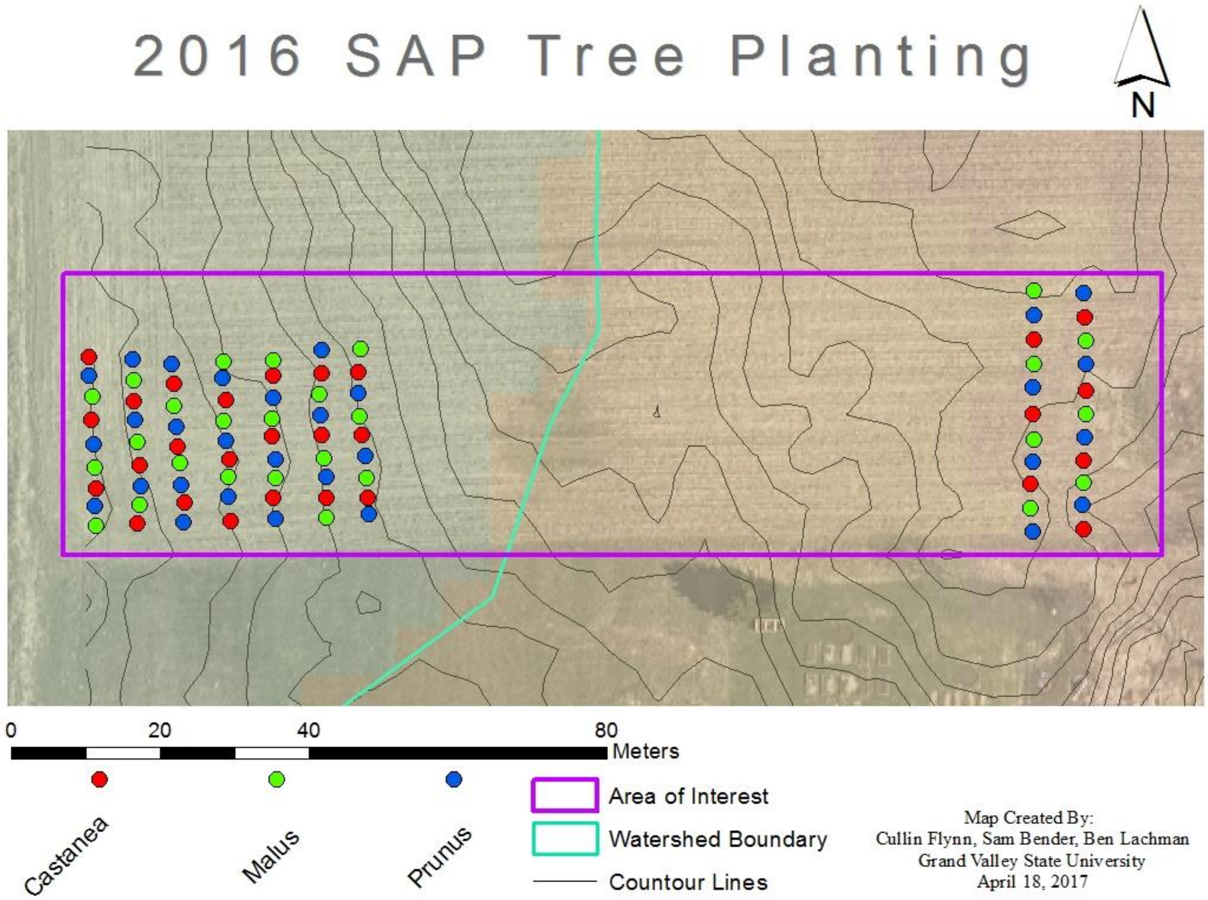


Figure 9. Final map.

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