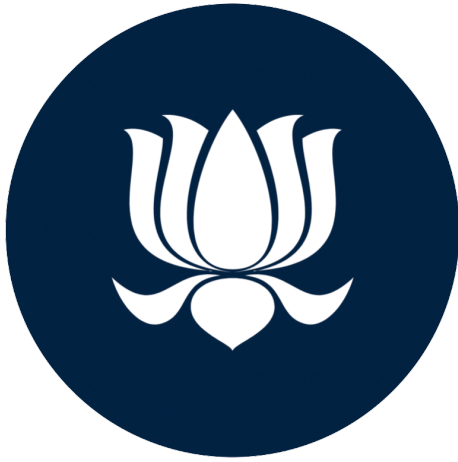


Volume Two.



SYSTEMATIC REFLECTIONS

A PEDAGOGICAL JOURNAL FROM THE CENTER FOR TEACHING AND INNOVATION AT CCSU

Kristine Larsen and Christina Robinson, Editors

March 2022



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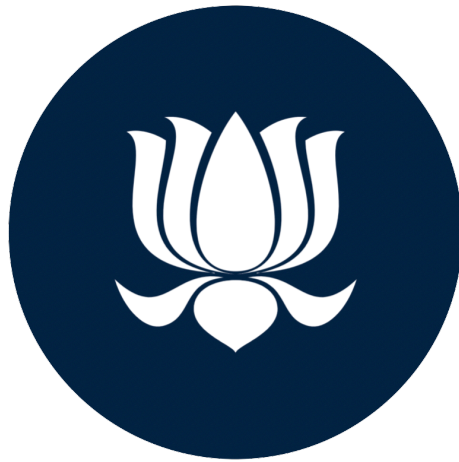
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Dear Colleagues,

I am delighted to introduce to you *Systematic Reflections*, Volume 2, the peer-reviewed journal developed by the Center for Teaching and Innovation. Since the publication of the first volume at the start of a pandemic, our campus community came together to support each other and our students. We truly are stronger together!

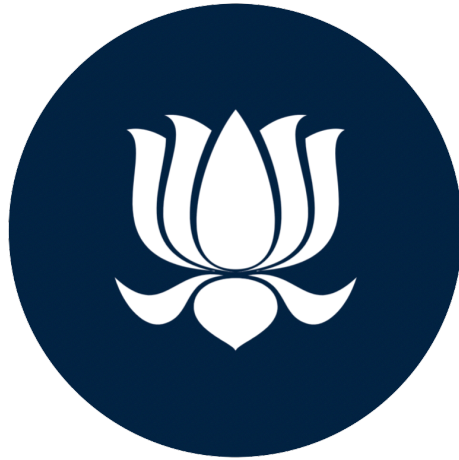
The COVID-19 crisis required that we step outside of our comfort zones. In doing so, we were afforded unique opportunities to grow professionally—to push ourselves. At first, we needed to quickly adapt to an all-virtual environment. Later, we learned to reconnect with one another face-to-face while still maintaining an online presence. While reimagining course content and teaching strategies, meeting our students' needs remained our top priority. Volume 2 shares such stories about our responsiveness to these shifting parallels that illustrates the grit, collaboration, and innovation of our campus community.

Each author deserves recognition for sharing their story and showing us how to step outside our comfort zones. Their willingness to “fail forward” is important to recognize. This concept reminds me of a John Maxwell quote, “Everything in life brings risk. It's true that you risk failure if you try something bold because you might miss it. But you also risk failure if you stand still and don't try anything new.”

Lastly, I want to acknowledge and thank Drs. Kristine Larsen and Christina Robinson for putting together this second volume. Their support for the faculty and staff on campus is unparalleled.

Thank you all and keep up the excellent work!

Dr. Kimberly T. Kostelis
Interim Provost & Vice President of Academic Affairs



Great disruptors are agents of great change; or, at least, they can be. Certainly, the greatest disruptor of recent times has been the COVID-19 pandemic. As we pass the second anniversary of the official declaration of the pandemic, we take the time to reflect upon what we have learned – about ourselves, our students, our colleagues, and our teaching. Consequently, this issue features reflective essays written by a broad range of colleagues, including department chairs, professors, and faculty development professionals. Which lessons will we take forward with us through 2022, into the “After Times,” now that the landscape of higher education has been forever changed? How can we continue to celebrate and capitalize on the tireless effort, flexibility, and creativity, that we and our colleagues (and ourselves) somehow found the strength to power through over the past two years?

But while the COVID experience led to an unprecedented spike in creative pedagogy (by necessity), it also disrupted the normal process of research, writing, and publication for many of our colleagues. Therefore, we are also pleased to publish several pieces that concentrate on important pedagogical innovations developed before the pandemic so rudely shook up our lives, innovations that will certainly continue to have an impact as we emerge into whatever comes next.

With this issue we celebrate the hard work of the recent past, and look forward to continuing to improve as educators and lifelong learners going forward.

—Kristine Larsen and Christina Robinson

TEACHING WITHIN THE ANTHROPOCENE

GARY GOMBY

THE MULTIPLE MEANINGS OF THE ANTHROPOCENE

The notion that the Holocene, the present geologic epoch, has ended and a new, human-dominated epoch, the Anthropocene, has begun, is now more than two decades old. At a Mexico City symposium in February 2000, Nobel laureate Paul Crutzen declared that “we no longer live in the Holocene...we live in the... Anthropocene” (Schwägerl, 2015). Crutzen’s informal pronouncement at the Mexico City meeting was followed by his paper with Eugene Stoermer later that year, in which the authors suggested that the central role of human activities in global geology and ecology should be recognized by the term “anthropocene” (Crutzen & Stoermer, 2000). The Anthropocene—with a capital “A”—recognizes that human domination of the Earth System has become so profound and pervasive as to rival the great forces of nature (Steffen et al., 2007); that our disruptive global imprint is so deep as to warrant official designation in the Geological Time Scale (GTS).

What is the meaning of the Anthropocene, the Human Age? Is it to be strictly limited to a geologic definition—the termination of the Holocene, the last 11,770 years, and the beginning of another epoch, as documented in the rock record? Or, as evidenced by its very name and the nature of the possible proxies used to demarcate it—radionuclides, fly ash, concrete, plastics, “technofossils”—is it something profoundly different? Unnatural, even antinatural, are these markers humanity’s iridium layer (to borrow from the extinction of the dinosaurs), our asteroid-like evidence of destructive, transformative planetary change?

Despite, or perhaps in spite of, attempts to define the Anthropocene only in terms of the Geological Time Scale (Zalasiewicz et al., 2017) the term has come to represent vastly more than an exercise in stratigraphy. At a profound level, the attempt to define a “Human Age” has endowed the term with an enormous power to provoke and reassess the essential nature of humanity’s relationship with the Earth, and our teaching of Earth and environmental science. Whether it includes rethinking globalization and world history in terms of collapsing the wall between human and natural history (Chakrabarty, 2009, p. 201), addressing global inequality and social justice (Parks & Roberts, 2010), or destabilizing the grounds of Western political philosophy (Grove & Chandler, 2016), the breadth of contemporary discussion regarding the Anthropocene encompasses scientific, anthropological, social, artistic, economic, historical, and paleontological points of view (Kress & Stine, 2017). Research and publication of articles involving the term “Anthropocene” has been a growth industry; between 2000-2015

citations number well over 8,000 (Brondizio et al., 2016) and the total number of articles has grown exponentially in nearly the same period (Chin et al., 2016).

While research on the multifold aspects and interpretations of the Anthropocene concept have proceeded apace, actual teaching of the Anthropocene has not. Inspired by Crutzen's suggestive phrase, researchers have investigated the Anthropocene while ignoring his admonition in 2011 of the importance of teaching students that we are *no longer in the Holocene*, but "... we are living in the Anthropocene...(r)ather than representing yet another sign of human hubris, this name change would stress the enormity of humanity's responsibility as stewards of the Earth. It would highlight the immense power of our intellect and our creativity, and the opportunities they offer for shaping the future" (Crutzen & Schwägerl, 2011, para. 6). The power of the Anthropocene as an educational tool lies in the enormity of its intellectual breadth and reach. The Anthropocene contains within it the potential for true interdisciplinary learning that can reach students from all backgrounds. This article addresses the rationale, organization, challenges and opportunities for teaching Earth and environmental science using the Anthropocene as its organizing principle. A close examination of a course that has been taught in the Department of Geological Sciences at Central Connecticut State University from 2015-2020 provides insights into the usefulness of this approach.

THE ANTHROPOCENE CONCEPT AS A FRAMEWORK FOR TEACHING GLOBAL CHANGE

The interdisciplinary nature and global extent of the Anthropocene (Kress & Stein, 2017) requires an integrative, inclusive, and innovative educational approach designed to engage and direct students from a diversity of backgrounds early in their school careers towards a greater understanding and concern about this new era. This educational approach must simultaneously demonstrate that solutions to complex, "wicked" problems (Rittel & Webber, 2014) will require both a broad understanding of science as well as culture and society (Drummond & Markin, 2008).

There are significant challenges, barriers to implementation, and other impediments to true development of new undergraduate curricula designed to address a world that is "complex and messy" (Elkana, 2016, p. 607). The three pillars of such change, "genuine interdisciplinarity, the education of concerned citizens, and the fostering of non-linear thought," (Elkana, 2016, p. 617) are the touchstones of the new Anthropocene educational paradigm. This directly reflects the growing recognition within the Earth System science community that "old concepts and methodologies cannot be an adequate approach to describing this new geological era... we need a new paradigm... that is founded equally on a deep understanding of the physical and biological Earth System—and of the economic, social and cultural forces that are now an intrinsic part of

it" (Donges et al., 2019, p. 151). This paradigm will not be easy to develop, initiate, or implement. But it will have to succeed.

The late historian and philosopher of science Yehuda Elkana (2016) recognized that "the most urgent world problems, like hunger, poverty, the spread of infectious diseases, the phenomenon of global warming, the scarcity of water and energy and many others, are distinguished by the fact that no one discipline can cope with them and often the kind of discipline that would be needed does not even exist" (p.609). Let us recognize, as have Laubichler and Renn (2014), that the Anthropocene concept is exactly the "kind of discipline" around which an educational framework for teaching global change can be constructed. The importance of communicating and educating the American public about global change in the context of the Earth System was recognized a decade ago as "Earth Science Literacy Principles" (Wysession et al., 2009). These nine "big ideas" of Earth science, i.e., the "set of essential ideas that a literate American should know about the geosciences," (Earth Science Literacy Initiative, 2020) can easily be reframed in the context of the Anthropocene, providing an over-arching organizational and thematic framework. Furthermore, reframing Earth System Science (ESS) around an Anthropocene narrative offers a new avenue for addressing the global challenge of Earth science education in the 21st century—"the disturbing gap between the potential of Earth science and its low profile in schools" (Orion, 2019).

A course on the Anthropocene necessarily requires a temporal, spatial, and cultural approach not ordinarily found within a typical Earth science, environmental science or sustainability course. The Anthropocene is the *human* epoch on Earth, (whether or not it is officially designated by governing bodies of international geological organizations), and thus it requires a *human-centered* approach. Discussion of the scientific basis for the Anthropocene does require explanation of geophysical and biological processes, but also demands the inclusion of human beings, who both impact and are impacted by these processes. This requires recognizing "sociocultural systems as a global force of nature," and as such, represent a "paradigm shift across the natural sciences" (Ellis, 2015, p.319). It is in this regard that instruction of the Anthropocene is wholly different than traditional geoscience or environmental science courses.

The human component of the Anthropocene is central to any discussion of global change. We are both the authors and characters in the story of the Anthropocene, therefore the motivations, aspirations, and destiny of these actors should figure prominently in its discussion. It is necessary to offer a literary and visual exploration of the Anthropocene, as well as a scientific exploration. For example, when we discuss Deep Time, the billions of years of Earth history, then we had best include artistic representations of this concept, as in the 2014-2015 exhibition "Imagining Deep Time," organized by Cultural Programs of the National Academy of Sciences, in Washington,

D.C. (CPNAS, 2014). This project included a wide range of artistic representations of Deep Time, including photography, maps, and soundscapes.

The Anthropocene is a human endeavor, and students must see themselves as part of this endeavor. We seek, therefore, to create a narrative of the Anthropocene which invites a human understanding of this epoch. This course is designed with a basic structural framework comprised of essential scientific elements necessary to a proper understanding of this epoch, as well as a complementary framework of literary and visual representations. Discussion of the biophysical consequences of Earth systems and their modifications must be linked to specific case studies, wherein impacts to individuals, specific groups or communities can be identified.

Such studies should specifically highlight topics or concepts that empower students with the knowledge that personal choices impact peoples and communities far removed from their own. *The core goal of the Anthropocene class is the reification of planetary change at the level of the individual; that is, the personalization of planetary change.*

No longer can we be content instructing students about scientific processes in the abstract; rather they must learn to recognize that they live in a telecoupled (Liu et al., 2013) world—a globalized, connected world—where choices made by individuals in one location have profound ramifications in distant places. For example, Chinese demand for pork products far outstrips domestic agricultural capacity for feedstocks. What are the consequences? China has met this demand by purchasing soy from foreign sources, including Argentina, the United States, and primarily Brazil. Between 2000 and 2014, imports of soybeans grew six-fold (Hertel, 2018). In Brazil, the production of soy has resulted in the conversion of millions of hectares of tropical forests, with profound impacts on carbon sequestration, ecosystem functioning, and biodiversity. Political and economic decisions cannot be ignored in the discussion of environmental impacts: the 2018 tariff dispute between the United States and China may have exacerbated deforestation, as China replaced American soy with larger imports from Brazil (Fuchs et al., 2019).

Everyday products can become teaching examples: coffee and the myriad products that include palm oil or palm oil derivatives have profound impacts on biodiversity, ecosystem services, poverty, hunger, and economies across the globe (Jha et al., 2014; Vijay et al., 2016). Masked by opaque supply chains, end users, often in the most developed nations, unwittingly abet socioeconomic and environmental damages that are unseen and unaccounted. In another example, groundwater unsustainably mined from overexploited aquifers in the United States is exported in the form of agricultural products overseas. (Marston et al., 2015). The rare earth elements (REE) and conflict

minerals found in every student's mobile phone comes with heavy environmental and human costs borne in distant lands (Reisman et al., 2013; Wolfe 2015)—costs that every student should realize. Closer to home, demand for coal has driven mountaintop removal in Appalachia, with profound impacts to local and regional ecosystem processes, as well as significant impacts to human health. (Palmer et al., 2010).

TEACHING THE ANTHROPOCENE: BACKGROUND

The Anthropocene course, listed as GSCI 100 "Search in Geological Sciences: Human Impacts" in the Central Connecticut State University catalog, had its inception in the fall semester 2015, and has been offered 7 times, to a total of 178 students (~25 students/class). The course title was chosen with the thought that students would not recognize the term "Anthropocene," and therefore avoid the class. Informal polling over the last few years of instruction seems to have borne this out; many students indicated that the name probably would have scared them away. The course description uses the term Anthropocene, but in a most general fashion:

This three credit, non-laboratory science is designed to provide an understanding of the Anthropocene, the human epoch on Earth. The course will examine the relationship between humanity and the natural planetary processes upon which civilization depends, and how human activity is modifying these processes at unprecedented rates. We will examine natural systems, population, global and regional environmental issues, including the connections between food, water, energy and resource use, and climate change, as well as considerations of equity and social justice in the Anthropocene.

The course meets the University Study Area IV requirement for a general education science (non-lab) and the overwhelming majority of students have been non-science majors (Figure 1). Thirty-four different majors are represented, but only 9 students (5%) are STEM majors. The majority (~60%) of students are upper division and most of those are juniors (Figure 2,3).

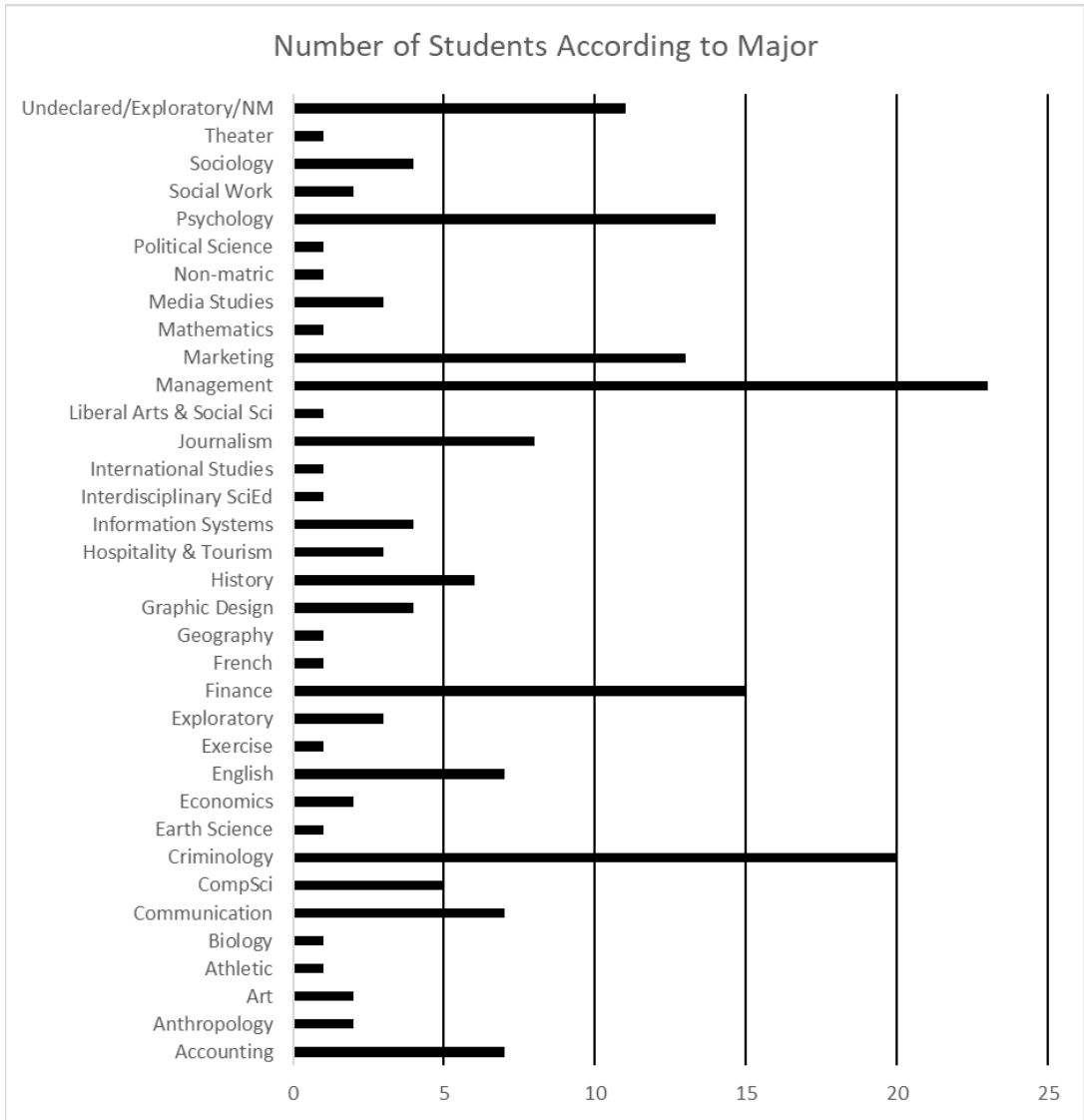


Figure 1. 178 students (2015-2020) assorted by major.

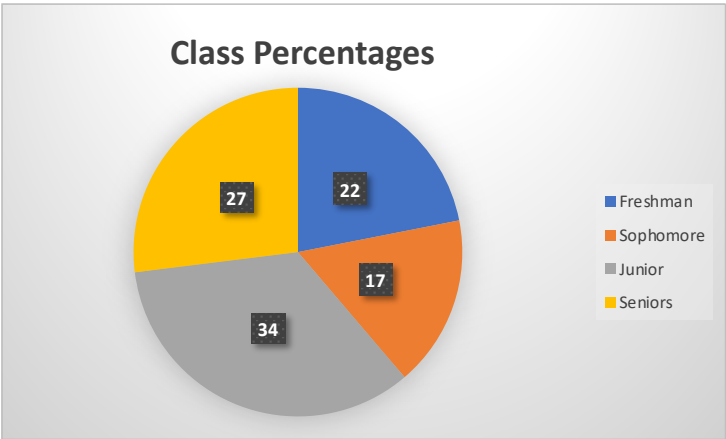


Figure 2. Students assorted by class (n=178)

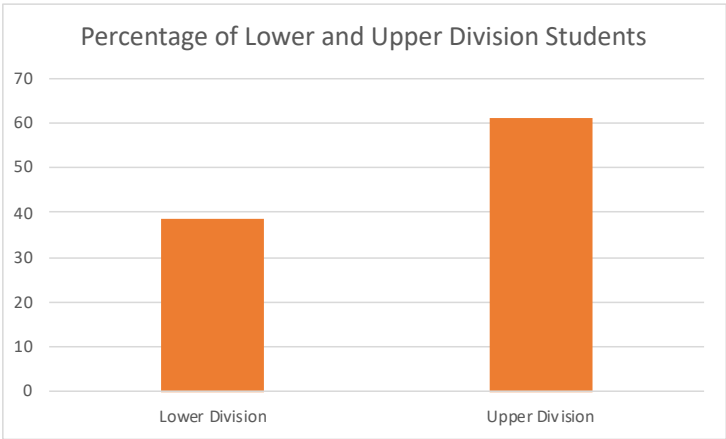


Figure 3. Percentage of students grouped by division (n=178)

The class is offered in a twice-weekly, 75 minute/day format. Much of the reading material has been created especially for the class, along with a curated collection of materials from journals, magazines, and websites. Over the last year, an extensive website/blog called *The Anthropocene Dashboard* (<https://theanthropocenedashboard.com>) has been designed and launched, providing considerable additional data and articles pertaining to global change and the Anthropocene. Several texts have been tried, beginning with a standard environmental geology text (Keller, 2012), followed by Kress & Stine (2017), and Hackett et al. (2018), before finally settling on the very short, concise survey of the Anthropocene by Ellis (2018). Keller's text, while excellent for an environmental geology class, proved too hard to adapt and was an expensive, but poorly used student resource; Kress & Stine is an edited collection of very short essays on a wide range of Anthropocene topics, and has good sections on artistic and literary responses to the Anthropocene, but is very weak on the science of the Anthropocene. *Anthropocene* edited by Hackett et al. (2018) has powerful photographic images, but also lacks the depth and coherence required, and is really designed to accompany the original photographic exhibit. Erle Ellis' little book offers the best explanation of the Anthropocene concept, its origin and implications, is available in both electronic and print, and remarkably affordable (about \$10). It provides an excellent summation of the basics of the Anthropocene debate, and is a useful supplement to the other materials prepared over the last 5 years. However, there isn't an ideal text for this class, because like the Anthropocene itself, events and research are moving rapidly. A static text is therefore almost inappropriate for this course, and the instructor must be ever mindful of new information as it becomes available.

This course takes as its premise the assumption that the current geological epoch (i.e., the Holocene) has ended and a new Anthropocene epoch has begun, in which "humans and our societies have become a global geophysical force" (Steffen, Crutzen, & McNeill, 2007, p. 614). This definition thus requires an understanding of "global geophysical force," which necessitates the instruction of basic Earth science processes that link the hydrosphere, atmosphere, lithosphere and biosphere. The goal is to convey information demonstrating how Earth systems function and how humanity is both affected by these processes and is capable of modifying them. The course is designed as a narrative, beginning with discussion of Earth system science and humanity's place in this system—are *we part of* or *apart from*—the biogeophysical flows of energy and matter which shape our world? The answer to this question lies at the heart of this course.

The overarching themes reflect five underlying premises of the Anthropocene: (1) **human agency is planetary in scale** (Donges et al., 2017); (2) **demand driven by growing, increasingly wealthy, and urbanized populations** for forest products, agriculture (crops and livestock), and fisheries (wild capture and aquaculture) has led to

conversion of natural ecosystems to **production ecosystems** (Nystrom et al., 2019), which are (3) **telecoupled** to human socioeconomic systems across local, regional and international distances (Liu et al., 2013; Liu, 2017); (4) coupled socioeconomic systems and components of the Earth system are dynamic and display planetary-scale **feedbacks** (Donges, et al., 2107); (5) profound issues of **environmental justice and intergenerational equity** exist due to enormous disparities between the primary agents of planetary disruption (i.e., wealthy, developed nations) and the hundreds of millions who bear the brunt of that disruption in the form of air and water pollution, violence, displacement, poverty and hunger (Nixon, 2011; Hansen et al., 2013).

Discussion of these topics is framed around the **planetary boundaries** (PB) concept introduced by Rockstrom et al. (2009):

To meet the challenge of maintaining the Holocene state, we propose a new approach to global sustainability in which we define planetary boundaries within which we expect that humanity can operate safely. Transgressing one or more planetary boundaries may be deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental- to planetary-scale systems. We have identified nine planetary boundaries and, drawing upon current scientific understanding, we propose quantifications for seven of them (Rockstrom et al., 2009, p.472).

Recognizing that the planetary boundaries and associated control variables (Figure 4, 5), boundary determinations, and assessments are somewhat controversial and imperfectly assessed, the PB concept is nonetheless a valuable pedagogic tool for structuring the discussion of (1) the scale and speed of change within each category, (2) the consequences of change, (3) the existence of thresholds and tipping points in the Earth system if PBs are exceeded, and (4) the role of sustainable development in order to stay below planetary boundaries.

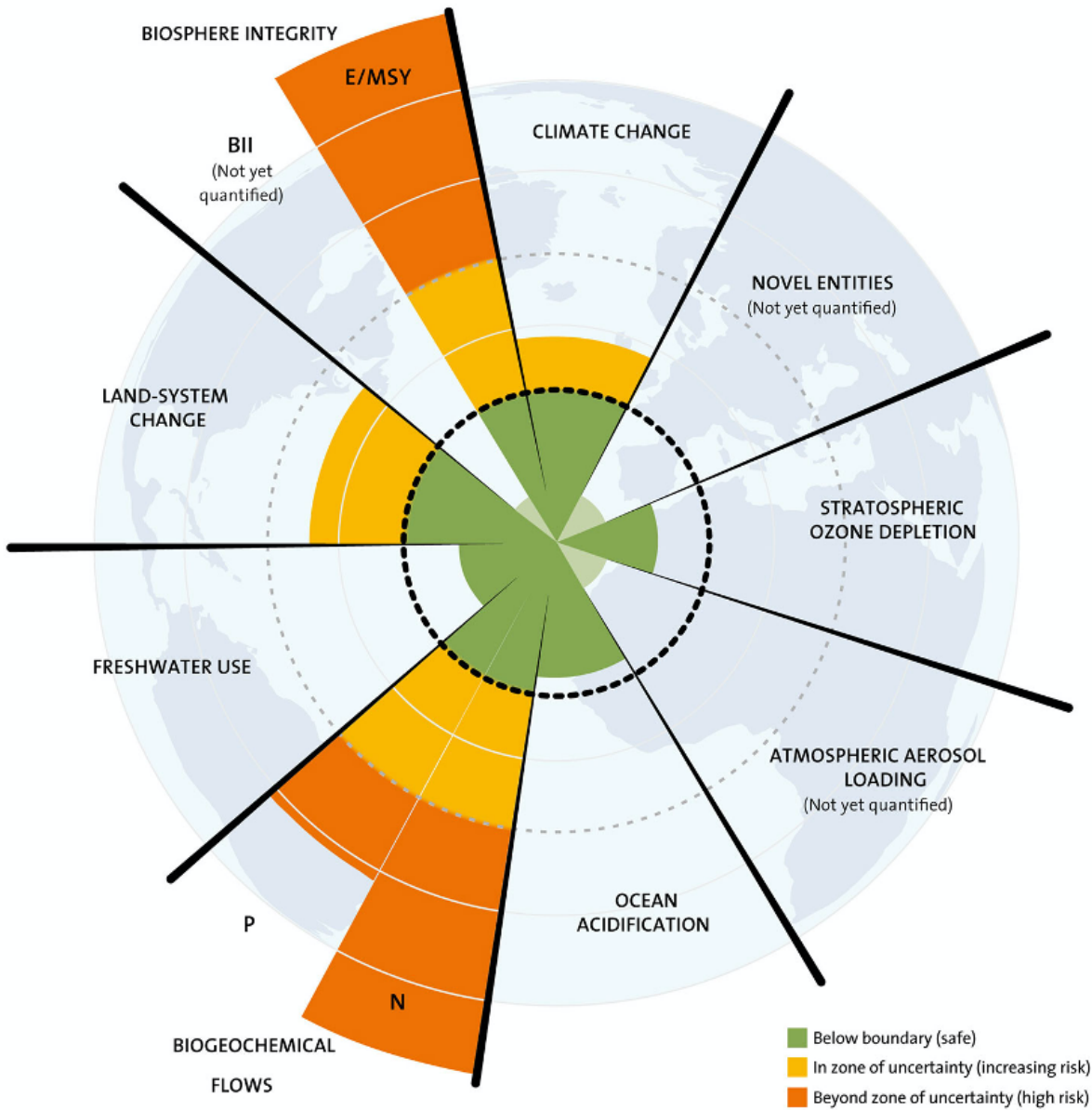
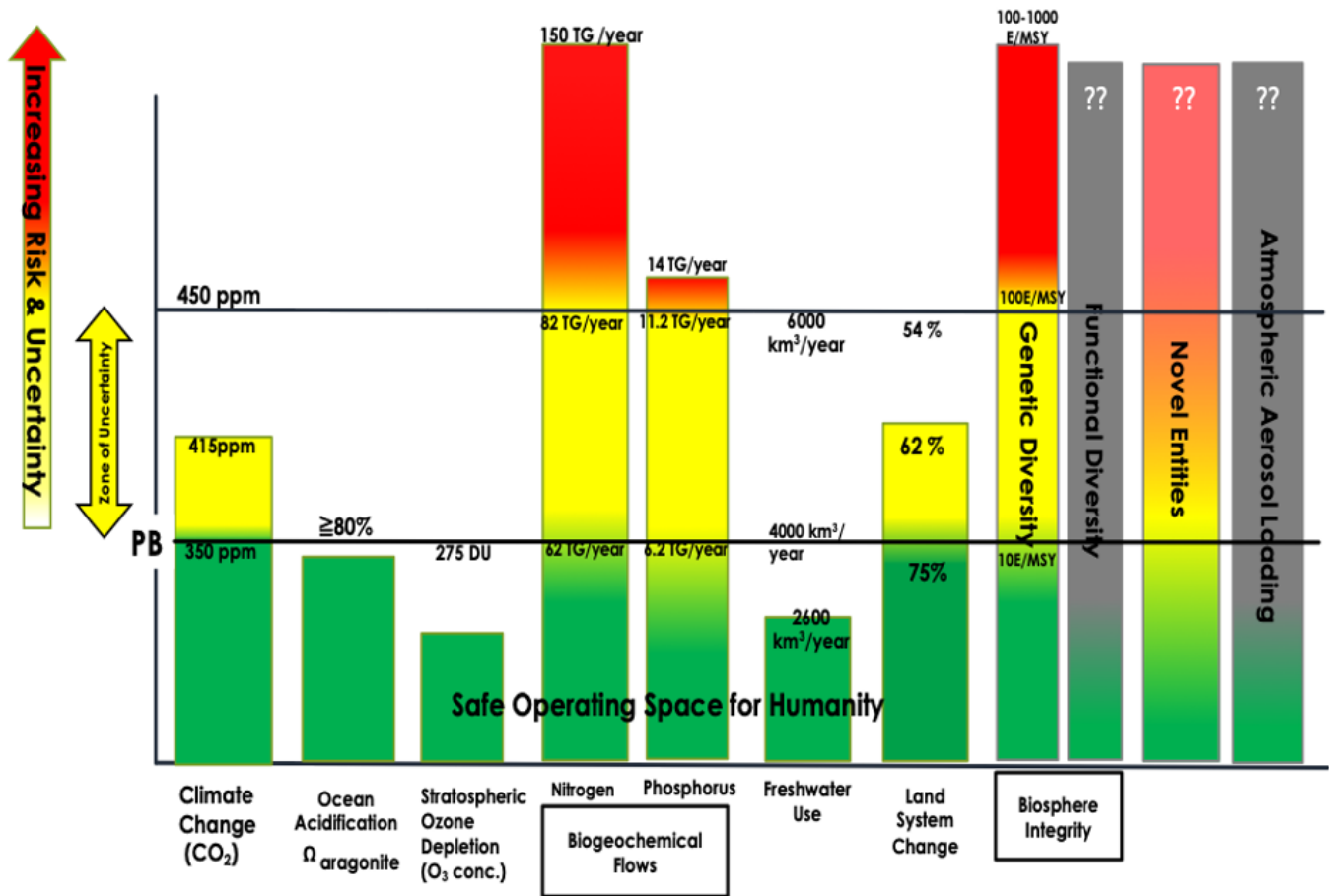


Figure 4. Planetary Boundaries (credit: J. Lokrantz/Azote based on Steffen et al. 2015. Used with permission). Nine planetary boundaries within which humanity can maintain a “safe operating space” (inner dashed circle). It is estimated that four (biosphere integrity, climate change, land system change and biogeochemical flows) of the nine boundaries have already been exceeded. Source: <https://stockholmuniversity.app.box.com/s/avnyhh4xzshxb19j82hn5mf3hxyuvqj0>



Explanation of the PB Boundaries

- Green zone** is the "safe operating space for humanity"
- Yellow** is zone of uncertainty
- Red zone** is area of high risk and uncertainty
- Grey** indicates planetary boundaries for which the control values are unknown.

Figure 5. Planetary Boundaries and Safe Operating Space Control Variables. Earth System Processes (bottom row) and Control Variables (aligned along Planetary Boundary line). Figure by author based on data from Table 1, Steffen et al. 2015.

TEACHING THE ANTHROPOCENE: COURSE ORGANIZATION

Using the principles previously outlined, the Anthropocene course can be organized in many ways, with greater emphasis placed on topics that may reflect the instructor's background and personal interests. Over the last five years, the course has been divided into four sections: (1) Basic Concepts, (2) Tectonic Processes, (3) Planetary Boundaries, (4) Intergenerational Equity and Sustainability. Appendix 1 provides an expanded description of each section and component subsections. Section 1 emphasizes broad ideas, including Earth systems, Deep Time, the Geological Time Scale, rates of change, human demography, and ecological footprint, and concludes with the evidence and discussion regarding the nature and placement of the Anthropocene epoch's stratigraphic starting point summarized by Zalasiewicz et al. (2017). Considerable emphasis is placed on growth rates, in an effort to communicate the significance of exponential change, particularly as it relates to populations. Human population growth, coupled with growing levels of affluence and demand for resources, is a key driver of planetary change, and there can be no real understanding of the latter without recognizing the consequences of where and how fast the former is occurring. The personalization of anthropogenic change is explored using the "IPAT" concept first developed by Ehrlich and Holdren (1971) and then at a fine-grained level as students explore their "ecological footprint," developed by Wackernagel and Rees (1996). Section 2 returns to basic geological processes, beginning with plate tectonics, a basic understanding of which should be required of every student. The relevance of plate tectonics to the welfare of human populations connects directly to previous discussion of the growth of megacities. Rapid urbanization, particularly in Asia and Africa, is occurring in coastal regions, which are subject to earthquakes, tsunamis, coastal storms, and rising sea levels.

The conversion of natural ecosystems to global production ecosystems (Nystrom et al., 2019) is an often underappreciated but critical aspect of global change, often entirely absent from the public discourse focusing on "global warming." Section 3 leverages this topic to unify the discussion of planetary boundaries, including land-system change, biogeochemical flows, freshwater use, and novel entities. The conversion of the American Great Plains grassland ecosystem to an agricultural commodities production ecosystem affords opportunities to examine extensification and intensification of agricultural production and subsequent impacts to soil health, surface and groundwater flow and quality, fertilizers, pesticides and genetically modified organisms.

Conversion of grasslands, forests, and peatlands around the world for the purposes of commodity production exemplifies the complex pathways linking individual consumer choice and global change. The opaque nature of these supply chains helps perpetuate ongoing environmental destruction and detrimental impacts to local communities. Production of palm oil, coffee, soy, and beef on a vast scale has resulted in overdrafting

of groundwater, pollution of drinking water by pesticides and fertilizers, growth of concentrated animal feed operations, construction of megadams, creation of Dead Zones, and global dispersal of persistent chemical pollutants. Heightened awareness and knowledge is empowering; students can potentially leverage new and improved understanding of consumption choices to alter their behavior.

Profound changes in land use are also related to climate change, both as a cause and consequence of a warming planet. Impacts to biodiversity stem directly from habitat destruction and fragmentation, and illicit trade in plants and animals, and are further exacerbated by shifting temperature and rainfall regimes. Marine ecosystems are also impacted by commodity driven overfishing, warming temperatures and declining pH. Telecoupled human socioeconomic and environmental systems link individuals and communities ever more tightly across local, regional, national, and international scale. The primary driver of climate change, the combustion of fossil fuels, is the focus of the final planetary boundary element. This section includes basics of paleoclimatic reconstruction, data-based evidence of contemporary global climate change, and the pivotal role of coal combustion in these changes. A very prompt cessation to coal combustion is a requirement if we as a global civilization are to avoid considerably higher global temperatures and their attendant impacts. The final component of the course, Section 4, draws some conclusions regarding the consequences of our continued trajectory in the Anthropocene, and raises deeper issues of social justice and intergenerational equity.

PEDAGOGICAL METHODOLOGY

As the course has evolved, so have instructional and assessment methods. The absence of a text has proven somewhat challenging to students who always want a reading and end-of- chapter homework assignment. It has required the extensive development of reading materials to replace a formal text. This is hardly a trivial matter; after five years, the course materials now number in the hundreds of pages, including what most would regard as entire chapters. Fortunately, there is a vast amount of material available online in the form of readily accessible article and geoscience / environmental science websites, especially those related to climate change. The course website (www.theanthropocenedashboard.com) also contains a considerable amount of information on planetary change in the Anthropocene.

Before the pandemic, twice weekly meetings were a mix of short PowerPoint presentations, coupled with at least one in-class small group or individual assignment. These involved online interactive websites, such as those available at Annenberg Learner (<https://www.learner.org/series/the-habitable-planet-a-systems-approach-to-environmental-science/human-population-dynamics/online-textbooks/>). Other activities use online materials and websites, including an interactive EXCEL spreadsheet that

allows students to modify the logistic growth equation and observe the resulting changes graphically, visualization of global change using NASA Earth Observatory (<https://earthobservatory.nasa.gov>), visualization of deforestation trends (Global Forest Watch, <https://www.globalforestwatch.org>), deforestation and supply chains (TRASE, <https://trase.earth>), and watershed simulations (Model My Watershed, <https://modelmywatershed.org>). Occasional minute papers have been useful ways of learning what issues may be problematic. Another recent change has been the increase in the number of short quizzes. A recent study (Sotola & Crede, 2020) indicates that frequent, low stakes quizzes contribute to improved academic performance and a large increase in the odds of passing a class. These quizzes are very short, allowing enough time to review them immediately, which should improve retention of material.

A midterm and final exam using a subset of study guide questions has been used for all classes. Open book, open note exams during the period of remote learning the last two semesters has resulted in somewhat improved performance (class averages approximate a half-grade point higher). The final exam has also contained a three-paragraph essay based on the flow chart from Vitousek (1997). Students must explain the chart, which requires an understanding of global linkages, causes and effects that have been emphasized during the semester. A term paper and short oral presentation have always been required. Topics are chosen from a long, diverse list designed to offer “something for everyone” and provided at the beginning of the semester. Topics range from the Tohoku earthquake, the threat of volcanism in Naples, rising sea levels in Miami, forensic geology, art and the Anthropocene, environmental impacts of coffee consumption, and the impacts of dam construction on Amazon indigenous peoples. Oral presentations would be impossible for large groups; 25 students require three class periods, which may be more than most instructors would like. However, presentations are usually well-received, and attendance and participation reinforced by adding questions on the presentations to the final exam.

CONCLUDING THOUGHTS

After seven iterations of this course, there are a number of important lessons to be drawn. One of the original goals behind the creation of an Anthropocene course was to attract entry-level students into the geosciences. There is no evidence that this has occurred; the overwhelming majority of students are non-science majors and upper division, including many seniors (27%). This is probably a consequence of at least two factors: (1) the course fulfills the University breadth requirement for science, consequently the overwhelming majority of students taking the class are non-science majors, and (2) it is not a requirement of the geological sciences or the biology majors (both have environmental subspecialties). It can be concluded that better “marketing” efforts have to be undertaken to attract first-year students, particularly those who might

have interest in pursuing environmental or geoscience careers. This might be as simple as rebranding the course with a new, more attractive title or description.

At the same time, it is equally clear that the class may well be the only science course many students take while at the University (if they transfer in their lab science credits). A single-discipline class (e.g., geology, meteorology, biology, chemistry) will simply not provide these students with an overall understanding of global change—one that extends well beyond “global warming” and “climate change.” A course on the Anthropocene thus may be the *only opportunity these students may ever have* to learn about the complex relationships between socioeconomic systems and environmental systems as drivers of planetary change. Perhaps even more critically, it explicitly links the science of global change with social justice and intergenerational equity.

These latter issues will take on ever-greater significance as the Anthropocene accelerates. The choices our students make after leaving the University—where they choose to live, their choice of livelihood, the food they eat, how they travel, what they purchase, whether they choose to have children—will impact the future of this planet. Globe-girdling supply chains connect us with unseen lives and unseen damages in distant lands—the “slow violence” of which Rob Nixon (2011) has written so eloquently and powerfully. The goals of teaching the Anthropocene thus go well beyond the science. There is now a moral imperative to teach the science of global change and with it, to recognize that we are all complicit in the creation of the durable, permanent imprint in the rock record that stratigraphically demarcates the Anthropocene epoch.

This isn’t a new message; recognition of humanity’s power over the planet’s natural biogeochemical processes can be found in environmental texts published more than four decades ago. Consider this quote from the remarkably prescient textbook *Ecoscience*:

What is alarming is that civilization, while unable to replace the natural services upon which its survival depends, has become a great enough disruptive force to undermine them. The available evidence is insufficient to prove conclusively that disaster is upon us, but it indicates we are playing in a league where environmental balances on regional and global scales hinge on human actions (Ehrlich et al., 1977 p. 955).

Twenty years later, the scale and scope of human-dominated planetary change were succinctly summarized by Vitousek et al. (1997) when they described the “growing scale of the human enterprise,” suggesting that “the rates, scales, kinds, and combinations of changes occurring now are fundamentally different from those at any other time in history; we are changing the Earth more rapidly than we are understanding it” (p. 498).

Three years later, Crutzen declared these changes were so substantial as to constitute a new geological epoch.

What has happened in the intervening decades that we should now conclude that human global disruption is so great it warrants recognition as a geological age? Like no other species, like no other human generation, we possess technology with which we can modify planetary processes—and even modify life itself by manipulation of genetic material. In his environmental encyclical *Laudato Si'* (2015), Pope Francis used the word “rapidification” (Chapter 1.18) to describe the unprecedented speed at which our lives and world are changing. “Rapidification” captures an essential difference between the Anthropocene and the Holocene. In 1977, when *Ecoscience* was published, global population was 4.2 billion. Now it is nearly 7.8 billion, and barring planetary catastrophe, will likely reach 9-10 billion by midcentury. Armed with the technological abilities of the modern industrial state, powered by seemingly inexhaustible supplies of the carbonized remains of plants and animals from the distant past, accelerated by instantaneous communications, human activities now threaten the natural processes which sustain civilization. We are appropriating significant proportions of net primary production, modifying essential biogeochemical flows of nitrogen and phosphorus, elevating greenhouse gas concentrations to levels unseen during the Holocene, and diminishing global biodiversity on a scale and pace rivaling the five past great extinction events (Diaz et al., 2019). The rate of change in Earth system functions may be approaching or surpassing planetary thresholds (Rockstrom et al., 2009), with profound, intergenerational implications for human well-being (Hansen, et al., 2013; Steffen et al., 2018).

The biogeochemical processes that have to this point in time allowed for the truly singular and extraordinary flourishing of life on this planet are intimately linked. It is humanity's obligation and responsibility to understand our place within these linkages as well as our role and responsibility in their alteration. As science educators, there may be no greater responsibility, no greater need, nothing more urgent than to communicate the profundity of the Anthropocene to our students and to the public at large. The same vast improvements in technology that have contributed to humanity's greater global impact can also be wielded by educators to communicate more effectively and more persuasively than in decades past. Perhaps that is why the “Anthropocene” has become such a potent and popular term for representing the multifold character of global change in this Human Age supercharged by social media. The Anthropocene is perforce a global lesson in unsustainable human behaviors. The window of opportunity for human success on Earth has so far been the Holocene; we have now entered the Anthropocene, an epoch with profound implications for humanity's future. It is now necessary to not only *teach about* the Anthropocene, but *teach within* the Anthropocene.

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Appendix

Sample Outline of Lectures with Explanatory Notes

I. BASIC CONCEPTS

Introduction. The course is designed to answer the “a part of/apart from” question, and begins with a discussion of this phrase. Relationship of humanity to Earth systems; examples of impacts of these processes (tsunami, earthquake) and human impacts (desertification, deforestation, etc). Example of Munch’s *The Scream* as a means of discussing impacts of volcanoes on climate, which then leads to a discussion of the General Crisis of the mid-seventeenth century, and then can be turned to a discussion of climate change and current events, such as the possible link between drought and the recent Arab Spring uprisings.

“When” are we? Geologic Time and Human Evolution. It is essential that students have a basic understanding of the age of the universe, the Earth, and humanity’s incredibly recent appearance on our planet. Discussion of the newest findings regarding the origins of humanity and our migration across the planet are discussed. The importance of the relatively benign climate of the interglacial period (Holocene) to the success of human civilization is emphasized vis-a-vis potentialities for disruptive anthropogenic climate change. Discussion of rates of change in the context of “human time” versus geologic time.

Why numbers matter: population growth. Concept of linear and exponential growth is introduced; introduction to basic demography (birth, death rates; fertility; population pyramids); the trajectory of human population growth; implications of population growth on resources; location of future growth (megacities)—discussion of location of these cities in areas subject to natural forces—earthquakes, volcanoes, rising sea levels. Further discussion of rates of change.

The human footprint. This lecture follows the previous discussion of population growth and focuses on the “IPAT” concept developed by Ehrlich and Holdren (1971), and then moves on to “ecological footprint” as developed by Wackernagel and Rees (1996). Students use online resources to calculate their personal footprint, and then calculate an average footprint for the class. Provides the link between personal consumption patterns and resource impacts. Further discussion of the relationship between consumption, population growth, environmental impacts; sustainability; externalities; planetary boundaries.

And now the Anthropocene introduces the concept of the Anthropocene, the various opinions as to when it began, and a discussion of the “Great Acceleration,” the period starting in the 1950’s when virtually all metrics of human modification of Earth system processes begin exponential increases (see Steffen et al. 2015). This is a key lecture, and the concepts of the Anthropocene as outlined in Crutzen (2000) paper are presented. Discussion of rates of change.

II. TECTONIC PROCESSES

The Earth in motion; plate tectonics. An understanding of Earth systems processes requires that students understand plate tectonic theory. Like evolutionary theory for the life sciences, plate tectonic theory is the unifying theory of Earth science, and everyone should have a basic understanding of how it works. History of continental drift; development of plate tectonic theory, subduction zones and their relationship to volcanism and seismic activity.

Volcanism: much more important than you thought. This lecture could follow the lectures on earthquakes, discretion of the instructor. Basic explanation of volcanism, emphasis on volcanic activity and its role in extinction events (flood basalts), impacts on climate—discussion of aerosols, global cooling (discussion of the “General Crisis” of the mid-seventeenth century; cf Parker (2013)); location of human populations near volcanoes, impacts of volcanic eruptions (lahars, pyroclastic flows).

Earthquakes. These lectures can be arranged in two ways—a first lecture discussing earthquakes and their impacts, followed by a second lecture on the actual mechanisms of seismic activity. I prefer an impact discussion first, then the mechanisms after, but most Earth science texts prefer the opposite.

III. PLANETARY BOUNDARIES (PB)

A. PB: Land-system change; biogeochemical flows

Production Ecosystems: Terrestrial

This section of the course uses agriculture, particularly American agriculture, as a means of exploring the intimate relationship between natural processes involving soil and water resources—and human modification of these systems for agricultural purposes. This allows broad discussion of soil systems (“Critical Zone Science”), surface and groundwater flow, human modification (monoculture, irrigation systems), and the links between virtual flows of energy and water that arise from such modification. It further serves as a means of discussion for pollutants—eutrophication, pesticides, herbicides, antibiotics, and persistent organic pollutants.

Grass, Baseball, and Iowa; the importance of dirt. This lecture begins with a discussion of the movie *Field of Dreams*, which takes place in Iowa. The movie serves as a metaphor for the theme of repairing the past in order to repair the present. The grassy baseball field, carved out of a corn field (another species of grass) reminds us that the corn replaced the original Great Plains ecosystems, one of the outstanding biomes on the planet. Students learn about the original ecosystem, which was a fire-herbivore dominated landscape that evolved on loess left by the retreating ice sheets. This allows for discussion of climate change, soil development, and ecosystem resilience, followed by the destruction of this ecosystem by modern agriculture within 150 years. Norman Borlugh, the Nobel laureate and father of the Green Revolution, was born in Iowa. This allows a nice lead-in to a discussion of the importance of the Green Revolution, and its requirements for water, fertilizer and pesticides—the topics of the next series of lectures.

B. PB: Freshwater Use

Water and Food, the role of groundwater. Discussion of basic groundwater principles; importance of groundwater as a critical resource worldwide for agriculture and drinking

water. Consequences of groundwater withdrawals; subsidence, etc. Impacts of drought in California's Central Valley—groundwater withdrawn for agriculture leaves citizens without drinking water. Virtual groundwater transfers; water "footprint." Water scarcity; cash crops (cotton), biofuels versus food for humans. Possible impacts of a warming climate.

Streams and Floods. Introduction to the hydrologic cycle, stream flow basics, floodplains, deltas. Discussion of stream response to land use change (stream hydrograph); levees; Mississippi River floods.

Signature of the Anthropocene: Megadams. Discussion of dams, particularly megadams, as one of the hallmarks of the Anthropocene. Benefits and costs (economic, environmental) of dam construction. Implications of the Grand Renaissance Dam for Ethiopia, Sudan, and Egypt.

Water Pollution. Surface water pollutants derived from agricultural related activities; eutrophication; Dead Zones. Groundwater pollution (arsenic and Bangladesh); point and non-point pollution; groundwater plumes and drinking water wells; septic systems and water wells; antibiotics and CAFOs (concentrated animal feed operations) and environmental justice

C. PB: Novel Entities

Birds, Bees and POP's. Historical context of pesticide use; Rachel Carson and DDT; persistent organic pollutants—bioaccumulation and biomagnification. New evidence for epigenetic effects of low-dose exposure of children to pesticides and industrial chemicals. Changing role of pesticides in modern agriculture; genetically modified organisms and pesticides. Glyphosate as an example of herbicide-GMO-human health controversy. Impacts of pesticides on soil ecosystems; neonicotinoids and honeybee colony collapse.

D. PB: Climate Change

Energy and Climate; Significance of Coal. The final section of the course begins with an exploration of coal, and its role as the critical energy resource of the Industrial Revolution. Coal exemplifies many problems with energy resource extraction, and can be used to illustrate the link between agriculture, water, energy, and climate change. Coal combustion by China, India, and other developing nations is likely to overwhelm any decreases by the United States or other countries in carbon emissions. Study of its extraction and combustion illustrates the enormous impact of human activity has on the environment and human health, both at a local, regional and global level.

Coal: Burning the past to fuel the future. Discussion of why coal, and not other fossil fuels. Coal is the primary driver of carbon dioxide emissions and is the most important fuel for electricity production around the globe. Significance of China and India. Historical glance at coal use in England (quotes from Dickens, images of London fog/smog, paintings of Monet); inversions; killer smog of 1952; Donora, Pennsylvania; Shanghai, Beijing.

Coal: Origins. Geologic origins of coal deposits, distribution, rank, mining techniques (surface and underground). Discussion of Navajo Generating Station illustrates link between energy, water, agriculture, population growth, and pollution. Mountaintop mining in West Virginia.

Mountaintop Mining (MTM). Readings from *Science* on impacts of MTM. Video on MTM; in-class worksheet that describes environmental, economic, health impacts of MTM on local areas. Linked to online Earth Observatory (NASA) imagery and online quiz about identifying Connecticut powerplants that use MTM coal.

Climate Change From the Past to the Future. This series of lectures includes:

1. *The past as prologue.* Overview of ocean circulation (thermohaline circulation); short-term versus millennial climate change. Ice sheets, glaciers; causes of past global climate change—volcanism, solar activity, plate tectonics, albedo. Study of climate proxies; Milankovitch cycles, greenhouse gases; the Keeling curve.
2. *“Planetary Change in a Warming World.* What do we know? Conclusions from Berkeley Earth regarding carbon dioxide and global temperature increase; rates of increase; where increases are occurring. Impacts on the cryosphere (glaciers, ice sheets, sea ice, permafrost), and sea level rise; feedback loops.
3. *What will a warming world look like?* Recapitulation of temperature/carbon dioxide changes; sea level rise; role of coal, China and India; long residence time for carbon dioxide—locked-in sea level rise and warming; changes in biomes; species distributions. Importance of “tipping points” (Younger Dryas event); discussion of sudden ice sheet disintegration and sea level rise; inundation of coastal areas. Role of renewables. Uncertainty of global climate model projections; Paris conference. Importance of intergenerational equity.

E. PB: Biosphere Integrity/Extinction; Ocean Acidification

Production Ecosystems: Marine. Discussion of fisheries; unsustainable catch rates; threats to local economies due to unsustainable practices, pollution, hypoxia, plastics;

climate velocity exercises illustrating socioeconomic and ecosystem impacts of warming ocean waters on New England fisheries.

A Telecoupled World. Connecting human and environmental systems at a distance; deforestation in the tropics; Case Study: Pork & Beans—Sino-Brazil soy connection—*The Dark Supply Chain*. Rare Earth Elements; artisanal mining; conflict minerals

IV. THE MORAL IMPERATIVE OF THE ANTHROPOCENE: INTERGENERATIONAL EQUITY AND SUSTAINABILITY

Tragedy of the Commons; Our Common Home; Wicked problems. These lectures consider supply chain custody, and encouraging human and environmental sustainability

V. STUDENT PRESENTATIONS

Brief oral presentations by each student on their term paper topic.

Gary A. Gomby has been a lecturer in the Geological Sciences Department since 2015. His teaching and research focuses on global planetary change in the Anthropocene, emphasizing the linkages between geoscience and broader societal issues of equality, equity, and social justice. He has been a presenter, technical session and workshop leader on these topics at local, regional and national geoscience research and education conferences. He is the recipient of six faculty development grants focused on geoscience education and the Anthropocene.

GROUPING AND REGROUPING DEVELOPMENTAL MATH IN HIGHER ED

MARIAN ANTON AND KAREN SANTORO

ABSTRACT

Developing the foundations of mathematical thinking requires deep and challenging changes in the mindsets, habits, and strategies of students and their instructors. In this paper we present a few creative ways to offer math remediation that we are currently piloting. These are focused on algebraic reasoning with arithmetic models and active learning techniques. Our approach to curriculum and pedagogy aligns with research in math education and is based on historical evidence.

INTRODUCTION

CCSU previously had a 2-course sequence of developmental math for mathematically underprepared students—MATH 099, Elementary Algebra, and MATH 101, Intermediate Algebra. Both courses were traditional in content, primarily covering algebraic manipulation skills, as well as in approach, with lecture-style classes where students worked problems outside of class as homework. Neither MATH 099 nor MATH 101 was college-level. The MATH 099 did not, and still does not, carry any college credit and (the now former) MATH 101 carried 3 elective credits that did not count towards the 6 general education credits in mathematics that CCSU requires. The former MATH 101 was designed to serve all underprepared students, regardless of their major, and its lack of focus prevented it from serving our diverse student population well. It was clear that our students needed more individualized courses and that MATH 101 should be replaced by two new courses, MATH 102 Applied Algebra, for students who do not need pre-calculus, and MATH 103 College Algebra, for those who do.

The first pilots for the new courses started in fall 2016 with the design of Applied Algebra from original, classroom-tested handouts. In May 2017 we began to write *Algebra with Models—A Guided Inquiry Approach*, a textbook for Applied Algebra. The book was published by the end of the fall semester 2017, and on February 26, 2018, the Faculty Senate approved the new algebra program design. In spring 2018 we published a workbook for students to support the textbook and in August 2018 we organized instructor-training workshops. Both new courses, MATH 102 and MATH 103, are college-level and satisfy general education requirements. Each course has distinct, focused, higher-level learning objectives.

Data from the two-year pilots has shown that the passing rates in MATH 102 increased by more than 10% over those in MATH 101. Success in subsequent courses has also improved. Before the split, students in pre-calculus who came from MATH 101 passed

at much lower rates than students who placed directly into the course. Passing rates in MATH 103 are about the same as they were in MATH 101, but success in subsequent pre-calculus courses has skyrocketed to over 90%. Students coming from MATH 103 are performing far better than those who place directly in—reversing the passing rates between the two groups.

Now that the MATH 101 split is complete and has been shown to be successful, we have turned our attention to MATH 099. MATH 099 had been designed as a direct prerequisite to MATH 101, and as a result, many of our students' fundamental mathematical deficiencies were not adequately addressed. For more than six years, new content and pedagogical approaches for these students had been experimented and explored through the Summer Bridges Program. Bridges is an optional college readiness program for incoming CCSU first-year students that provides math instruction with the opportunity to earn exemption from MATH 099.

In the summer of 2018, we designed handouts for MATH 099 Foundations, held brief instructor training workshops, and wrote a first draft of a workbook. In the 2018 Bridges cohort, 73% placed out of MATH 099, but almost half of those passes were borderline cases. In the fall of 2018, we began a yearlong pilot for MATH 099 based on the fundamentally new redesign of the content and pedagogy from Bridges. The results of that first pilot for MATH 099 were mixed. In the summer of 2019, we intensified the Bridges instructor training, made major revisions to the course and to the workbook, and tested them in the Bridges Program. In that cohort, 84% placed out of MATH 099 with much higher grades and almost no borderline cases.

OUR APPROACH AND PHILOSOPHY

Students in developmental math face the same challenges that most college students face, but there are additional, math-deficiency related obstacles that in turn make other challenges more pronounced. For example, anecdotal evidence suggests that most students in MATH 099 experience high math anxiety and/or extremely low math confidence, and so in a struggle to manage time, such a student is more likely to skip a math class or math homework over other 'time-saving' choices. To help students we need to be sensitive and to address their emotional tribulations around math. To be effective, developmental instructors should incorporate lessons on time management, study habits, effective communication, and other soft skills into their teaching.

An active classroom that includes group work is one way to reduce tempting distractions such as cell phones, and to increase motivation and collaboration. While this strategy has its merits, sometimes it slows the class down. To meet our students where they are, we must go as deep as basic math, which students were supposed to master in middle school, but many apparently did not. Therefore, our design introduces

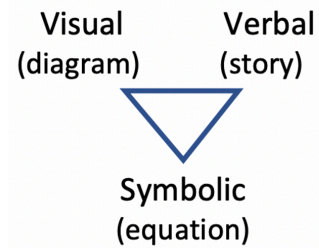
elements of visualization and reasoning to make the transition to college-level math through a deeper understanding of the basics.

In general, we have found that the more successful students have a positive attitude towards learning, and are much more likely to read, to do homework, and to actively participate in discussions by asking and answering questions. When a student has been reading the textbook, we can see more powerful examples and analyses in their written work, as well as richer vocabulary. We also see that students who take the time to do the basic expected practice perform better on the exams.

The pedagogy, or the way we communicate the math, also depends on the way we organize the curriculum. If the curriculum does not flow in an effective way, the delivery suffers. To achieve effective flow, we start with core concepts of mathematics and show how they develop in each topic. In MATH 099, we focus on the basic concept of **unit**, from which we build the operations. The operations are based one on another with the higher order operations derived from the lower order operations, like multiplication from addition, and the concept of unit depends on the operation. For example, how do we deal with the unit in multiplication? How do units change when we calculate an area?

The concept of unit also aids with visualization. For example, we ask students to identify the unit in a problem and visualize units through various diagrams. Visualizing the units is one important idea we emphasize throughout the course. Students also need some visual/physical support to understand concepts. That need holds for *all* people who want to learn or do math, including those in mathematical research. We develop models that are visual and/or physical to help us understand more abstract concepts. Our view is that it is a mistake to focus only on procedures, without any image to support them. Such support is especially important to developmental students because without this visual support, they lose confidence. They are very unsure if/when an answer is correct because they have no internal image of the math; they wait for someone else to confirm whether it is correct because they have no proof or justification for themselves. This causes stress, which consumes a great deal of energy. Instead of spending time learning, many students spend 'study-time' dealing with the anxiety; they sit in front of a book or notes and simply try to memorize a few things in the last minutes before an exam.

The central pedagogical triad used to understand a mathematical concept unifies three fundamental representations: verbal, visual, and symbolic. Students learn to verbalize a given diagram or symbolic representation (write a story), to visualize a given situation or symbolic representation (draw a diagram), and finally to symbolize a given situation or diagram using mathematical language (write an equation).



REASONING WITH MODELS

"From the most elementary class to the most advanced seminar, in both introductory textbooks and professional journals, diagrams are present, to introduce concepts, increase understanding, and prove results" (Mumm & Panza, 2012).

Much of students' math anxiety is a product of prior negative experiences. As faculty we need to encourage students to set those experiences aside and to keep an open mind. Trained by the educational system on how to pass exams, students avoid learning the concepts in favor of using easy-to-remember tricks to answer questions. For example, students can determine that a table does not represent a function, 'because an input repeats,' or that a graph is not a function because 'it does not pass the vertical line test,' but they don't know why. When asked, "What is a function?", they have no answer. The internet is full of such tricks, and while tricks can be useful, they should not replace the understanding of the concept. There is a great deal of damage done by this wrong way of learning math, and it is one of the main obstacles that we must overcome.

We want students to slow down and think rather than just trying random rules or procedures that they 'sort of' remember. Students often ask us to just 'give them the steps' and believe that all math is algorithmic and must be solved by a list of steps to be blindly memorized. Our approach is to replace the tricks with models, like diagrams, and to reason with them to derive correct procedures that make sense to the student. We change the question from "What is the final answer to the problem?" to "Draw a diagram to represent the problem and then show how to solve it." Students are asked first to use a pencil and paper to draw a model to visualize and to internalize an image for a problem, use it to formulate a strategy to solve it, and *then* apply that strategy to get an answer. For example, one learning objective is to represent numbers and operations visually and verbally. We know that 3×7 is 21, but can you tell a story? What are the units in the story? Can you draw a diagram? We want students to show that they understand multiplication and can recognize it in a context that is not symbolic. This is more challenging than indiscriminately applying a procedure, and students need help with this change.

Although research supports the use of models there are many challenges to the implementation of the new curriculum and approaches. Instructors often misunderstand the use of models, especially those who are unfamiliar with the Common Core. They often view the models as an optional support for procedures, used only to introduce them. It takes time for students to learn the models, to connect them with the procedures, and use them to apply the procedures correctly.

THE CURRICULUM

The content for the current MATH 099 pilot, called *Foundations*, is based on a core of arithmetic through modeling and extends to proportions, linear and non-linear expressions and equations, measurement, and geometry. Students can assimilate the material through practice and repetition in small bits that fit together into a more complex structure. The models provide visual, conceptual ‘proofs’ and support students’ mathematical reasoning by making connections between arithmetic and algebra. For example, we can see linkages across units:

Core Topics: Unit 1. Numbers and Basic Operations; Unit 3A. Power Operations.

Extension Topics: Unit 2. Proportions & Linear Equations; Unit 3B. Power Equations; Unit 4. Geometry & Measure.

Learning Objectives:

1. Boost student confidence and habits of mind that generate growth and effective mathematical thinking;
2. Reason with numbers and operations using verbal, visual, and symbolic models;
3. Apply operations to build up algebraic expressions and inverse operations to solve basic equations;
4. Apply operations to build up 1D, 2D, and 3D geometric measures.

THE MATH BEHIND FOUNDATIONS

THE CONCEPT OF UNIT

We invite the reader to do the following thought experiment. Suppose that you and your friends are each given a bunch of matchsticks and asked: How many matchsticks are there in your bunch? How many matchsticks are there in all the bunches together? How do we count? The answer is in the title of this article—by grouping and regrouping *units*.

According to a study (Ma, 2010), the U.S. School Arithmetic should not be just a collection of algorithms but a microcosm based on the concept of unit, the “unit (one)” being a simple but powerful concept. As defined in (Sheldon, 1886), “A **unit** is a single thing or one; as one apple, one dollar, one hour, one.” We can define “like numbers” as

numbers whose units are the same, as \$7 and \$9. The “unlike numbers” are numbers whose units are different, as 8 lb. and 12 cents. A main principle of arithmetic calculations is the following:

Fundamental Principle: Only like numbers can be added or subtracted.

With multiplication and division, the concept of “unit” is expanded: “A group of things if considered as a single thing or one, which is also a **unit**; as one class, one dozen, one group of 5 students.” (Sheldon, 1886.) For example, there are 3 plates with 5 apples each. How many apples are there in all? The main question in this example is “what is the unit, the one?” (Sheldon, 1886.) One answer is 5 apples.

According to (Beckmann, 2017), any multiplication can be brought to the form $M \times N = P$, where M is the abstract multiplier (number of groups), N is the concrete number of units in a group, and P is the product (total number of units). For example, the area of a rectangle 3 cm by 2 cm is the number of squares that fill up 3 rows (number of groups) of 2 squares each (number of units in a group). Each square is 1 square cm, a unit for measuring area.

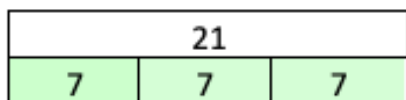
With fractions, the concept of “unit” is expanded one more time: “A unit may be divided into equal parts, and each of these parts becomes a single thing or a unit.” In order to distinguish between these two kinds of units, we call the first an **integral unit**, and the second a **fractional unit**. For example, what is the fractional unit of $\frac{3}{4}$? Of $\frac{2}{3}$? The answer is a fourth and a third respectively. When computing $\frac{3}{4} + \frac{2}{3}$, why do we need to turn fractions into those with a common denominator? See the Fundamental Principle above.

THE BAR-MODEL

Given a verbal situation, the visualization of the unit is the first challenge. To do that, we ask, “What are the **whole** and the **parts** in the given situation?” and represent each (positive) quantity by a bar. The task is to arrange these bars in such a way that the parts add up to the whole. Next, we use mathematical symbols to write the relation or the operation visualized by this diagram.

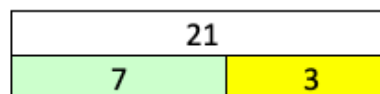
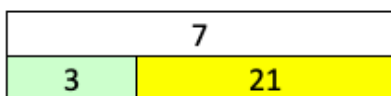
Example 1. We are given 3 plates with 7 apples each. How many apples are there?

Depending on the story, we may have either 3 groups (bars) of 7 units each or 7 groups (bars) of 3 units each giving a product of 21 units. The part-bars must add up the whole-part. In our example, we have 3 groups of 7 units each:



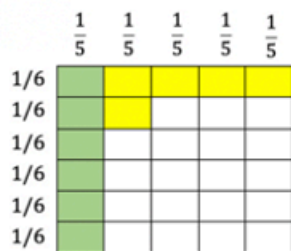
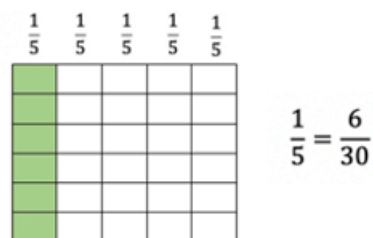
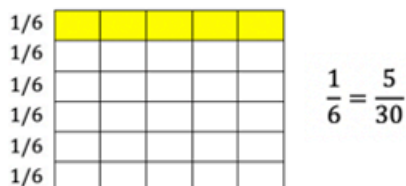
$$3 \times 7 = 21$$

Here are two examples of student misunderstanding of the bar-model:



Example 2. One sixth of the people living in a town are taller than 6 ft and one fifth of the people living in the same town are shorter than 5 ft. What fraction of the people of the town measure between 5 ft and 6 ft?

Here we can use an extension of the bar-model, called area-model. The area model is particularly useful to understand equivalent fractions.



$$1 - \frac{1}{6} - \frac{1}{5} = \frac{19}{30}$$

THE NUMBER-LINE MODEL

A number line is a line usually drawn horizontally with a point of origin representing the number 0 and a point of reference on the right of the origin representing the number 1. The distance between 0 and 1 is the unit, and every other number is represented by a point on the line whose distance from 0 equals the number of units in the given number.

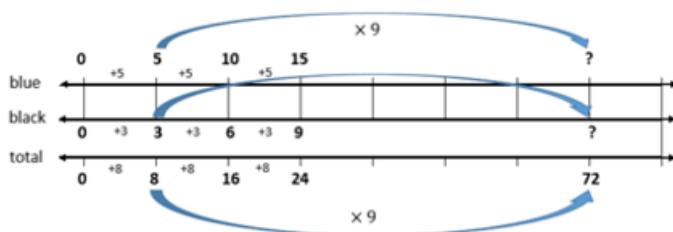
Example 3. We are given 3 plates with 7 apples each. How many apples are there?



$$3 \times 7 = 21$$

Example 4. In a box there are 5 blue pens for every 3 black pens. If there are a total of 72 pens in the box, how many blue pens are there?

Here we can use an extension of the number line – a triple number line, where each line represents a quantity in the problem. The ratio is shown by the alignment of 5 blue to 3 black pens, and that alignment is extended to the total of 8 pens. The answer is obtained by scaling these values by a factor of 9 to get the ratio of 45 blue pens to the total of 72 pens. Alternatively, we can solve the derived proportion which is obtained from the diagram.



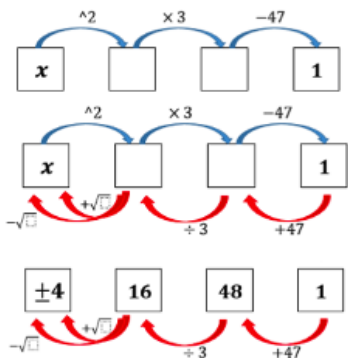
$$\frac{\text{blue}}{\text{total}} = \frac{5}{8} = \frac{b}{72}$$

These examples illustrate the triad by visualizing a situation and then symbolizing the diagram using mathematical language. Creating arithmetic models and using them for algebraic reasoning are high-level cognitive skills that students need for college-level math.

THE MAPPING MODEL

A simple equation is an equation we can reduce by combining like terms to an equation in one unknown, which occurs exactly once. In that case we analyze in which order we apply the operations to that unknown and draw a diagram representing this analysis, called the **Mapping Model**. To find the unknown we simply reverse the operations in the diagram.

Example 5. Solve the equation $3x^2 - 47 = 1$.



Step 1. Map the operations on the variable x .

Step 2. Map the operations in reverse order.

Step 3. Evaluate the inverse operations to solve.

This method is particularly appealing for using calculators. Notice that instead of x^2 we can have x^3 or 2^x or $\log x$ or any other operation whose inverse or inverses are known.

A BIBLIOGRAPHICAL NOTE

For the benefit of the reader, we include here a few studies that support our pedagogical techniques. The Bar-Model in (Koleza, 2015) is a conceptual model for multiplication problems and the formulation of the two corresponding division problems. The Double-Line Model in (Küchemann, Hodgen, & Brown, 2014) explores multiplication as a scaling. Our Mapping Model originates from an Egyptian papyrus (Chace, 1927) and is based on the modern view of operations as operators (Schubert, Molk, & Tannery, 1909). Its form derives from the Number-Line Model, but we cannot find it in the math education studies, yet.

DATA ANALYSIS

These deep and challenging changes in the habits, mindsets, and strategies of the students take time and require faculty development. For example, in a pre-test analysis, only 18% of the students in the 2019 Bridges program were able to calculate 21% of 1200 acres. In a post-test analysis, 70% of the students were able to answer that question by the end of the program. We don't have data on 'just-in-time' models, but achieving more than 52% improvement by brief 'reminders' seems unrealistic.

CCSU uses SAT/ACT scores or an Accuplacer test in math to determine the course level at which a student can be successful, according to the chart below.

<u>Old Math SAT</u>	<u>New Math SAT</u>	<u>Math ACT</u>	<u>Math Course Placement</u>	
450 or below	490 or below	17 or below	MATH 099	Elementary Algebra
460 – 490	500 – 520	18 - 21	MATH 102CB	Applied Algebra w/ Elementary Algebra
500 – 540	530 – 570	22 - 23	MATH 102 or MATH 103	Applied Algebra or College Algebra
550 or above	580	24 or above	-----	Various College-Level Courses

Table 1. CCSU Math placement rubric

In line with the current legislation, students who do not place into college-level math must be provided with remediation support, which may not bear college credit. The goal of MATH 099 is to bring these students to the same level as the students placed directly into college math according to Table 1.

We looked at the final grades of 1,066 students in MATH 102 who took this course in spring and fall 2019. Among them, 286 had passed MATH 099 to enroll and 780 placed in directly. Figure 1 shows that the grades in the MATH 099 group are skewed towards C, but the overall passing rates of the two groups are the same, around 66%. This shows MATH 099 meets its goal.

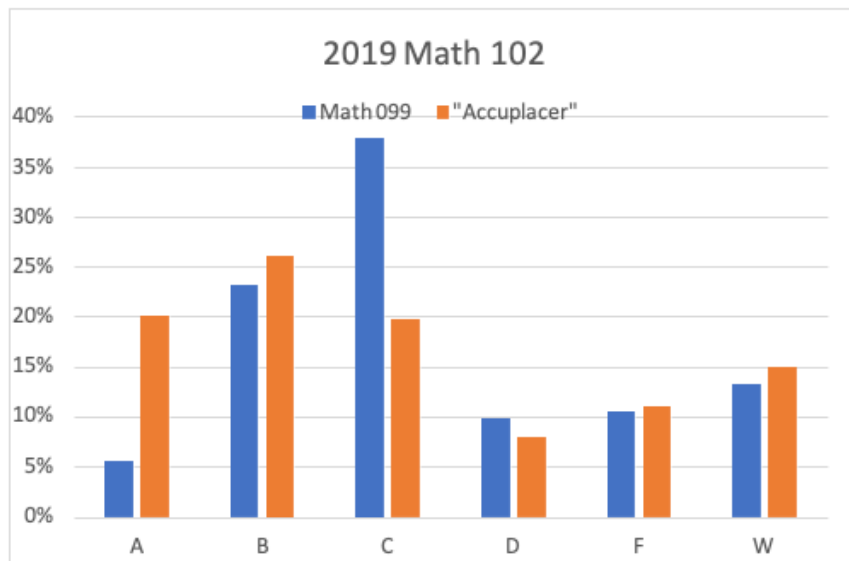


Figure 1. Math 102 grades (spring and fall 2019) grouped by satisfaction of prerequisite

In fall 2018, the content and pedagogy of MATH 099 was changed to focus on math foundations and grow mindset. We provided faculty development and new course materials such as a workbook and online homework. In fall 2019 we revised the course materials and continued to provide faculty development. We looked at the final grades of 407 students who took MATH 099 in fall 2018 and the final grades of 297 students who took the same course in fall 2019. The passing rates have been slightly improved from 52% to 57%.

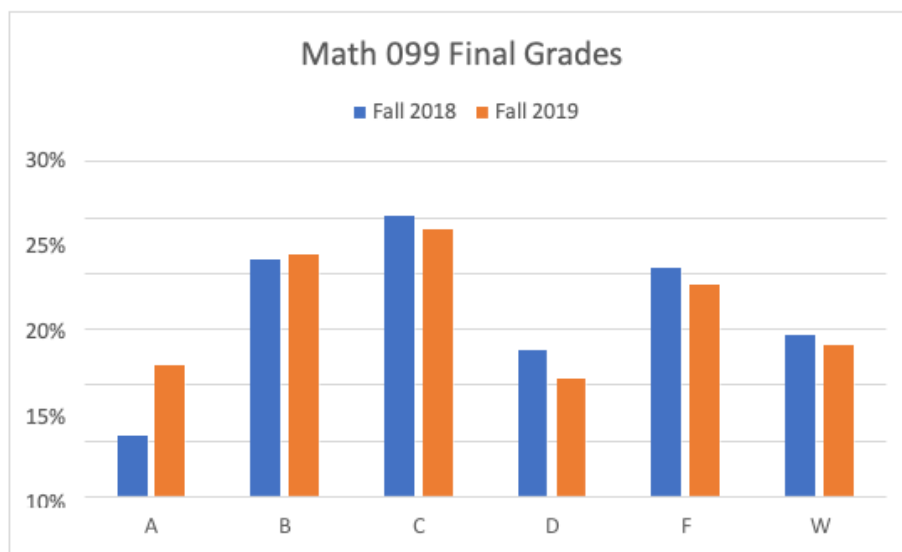


Figure 2. Math 099 grades grouped by semester

FUTURE CONSIDERATIONS: THE HARTFORD PROJECT

Remediating math deficiencies by embedding a few skill and fact reminders here and there in college level math courses does not address the real issue of lacking *foundational* understanding in math. Our approach is an alternative to embedding that aims to achieve this deeper understanding in a standalone course.

CCSU and Hartford Public Schools (HPS) are in a partnership discussion to address a way that HPS students can be placed into a college credit mathematics course. Many students graduate from the Hartford Public Schools unprepared for college level mathematics as measured by college entrance exams (including SAT scores). These students are required to take remedial math courses that are noncredit bearing, resulting in financial burdens that often deter students from continuing their college program after the first year. We therefore propose a CCSU College Math Readiness Program under the supervision of the Department of Mathematical Sciences at CCSU.

Some benefits of the program would be:

1. HPS students would be prepared to take college credit courses and continue college after their first year. Students will be motivated to know they are taking/ have access to a college course.
2. CCSU has the potential to recruit additional students from HPS and thus increase CCSU enrollment and graduation rates. HPS students would be encouraged to enroll in a 4-year university, knowing that they are more likely to persevere and graduate.
3. Students can preview college coursework and better understand what it means to be "college ready."
4. CCSU will reach out to an urban community near CCSU.
5. HPS has the potential to increase the number of college ready students in math.
6. Improvement in the quantitative literacy and problem-solving skills of HPS students at academic risk by filling their gaps in arithmetic and using arithmetic as a support for algebra and geometry.
7. A possible extension of the program to include a combo course with Applied Algebra.
8. Having the materials developed internally at CCSU, we can easily adjust to meet student and teacher needs.
9. The supervision of the program by the Math Department at CCSU assures scientific rigor and best pedagogical practices through faculty development.
10. Research and practice opportunities for faculty.

Some limitations of the program are:

1. Hartford teachers will need training on how to teach the course using mathematical modeling.
2. Hartford teachers and students will need access to CCSU's resources via Blackboard, and to the MATH 099 workbook.
3. Accuplacer testing will be needed to provide HPS and CCSU with a standardized assessment in order to place students in a credit bearing course.

ACKNOWLEDGEMENTS

We thank all the instructors of the developmental program who helped us design, test, and improve our program. We thank Robin Kalder, the chairperson of the Math Department, who supported the implementation of the program. We are grateful to Maria Mitchell for her leadership in facilitating the Hartford Project. Lastly, we thank the Sabbatical Committee for supporting one of us to create online resources for the developmental program.

DISCLOSURE

The data in this paper does not contain information that could lead to the identification of individuals through direct or indirect means. The samples are not coded with a link that could allow individuals to be re-identified.

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PEDAGOGICAL SUICIDE:
ONLINE TEACHING AND THE BRITISH CANON IN A HYBRID MA
PROGRAM IN LITERATURE
A CASE STUDY

MATTHEW GOLCHIN, ERIC LEONIDAS, AIMEE POZORSKI

INTRODUCTION

In the last decade or so, the rate of suicide among young people has increased nearly 50% (Curtin, 2020). The impacts of this sharp rise have rippled outward from mental health experts and youth organizations to the culture at large, and has had particular consequences for media directed at adolescent audiences. Caught off-guard by angry responses to the suicide of protagonist Hannah Baxter in its 2017 series *13 Reasons Why*, Netflix inserted additional warnings and launched a linked suicide prevention website before finally editing out the actual death as it was initially depicted. In the wake of the controversy, public health bodies like the World Health Organization (WHO) and the National Alliance of Mental Illness have offered advice to media producers, while professional media organizations have reviewed their responsibilities as creators of widely consumed "content." In the U.S., the National Alliance for Suicide Prevention has developed *National Recommendations for Depicting Suicide* (NAPS, 2020). In the United Kingdom, the Society of Authors and the suicide-prevention organization Samaritans released a similar guide, "Depiction of Suicide and Self-Harm in Literature" (Samaritans, 2020). Both documents cite research on the potential negative social effects of representations of suicide—the so-called Werther Effect—and the corresponding capacity of careful portrayals to create a "protective influence." Both also, in effect, offer aesthetic criticism, particularly in areas regarding authorial intent, audience reception, and the capacity of formal properties to create meaning apart from thematic content.

If the producers of media are being asked to take responsibility for their presentations and representations of suicide, and to shift their practices in response to this national crisis, what is the responsibility of educators who assign these materials, particularly to young people? Though most new guidelines are universal, the Samaritan document points out that young people are particularly vulnerable to depictions of self-harm (Samaritans, 2020).

Given the rise in suicide among adolescents, and the potential for controversy when dealing with such sensitive materials, educators can be forgiven for taking the Netflix approach: just drop it. But that isn't the theory behind the Samaritan guidelines that can imagine an effect like "protective influence"; nor has the general cultural reticence to

discuss mental health and self-harm done much to reverse the growing rate of suicide attempts among teens. Teachers of literature, film, and other media forms do not create the primary content they present, but they have an unusual opportunity to focus attention on various aspects, to provide multiple contexts, or to challenge unfounded or entirely subjective “readings.”

This case study offers further reflection on the role of the literature teacher compelled to teach the literary canon—a canon heavily populated with the suicides of young people, suicides often held up as inspirational moments of protest, brave challenges to the status quo, figures of society’s inability to protect the youth, or the most powerful example imaginable of speaking truth to power. On the one hand, we like to think that looking closely at the affective dimensions of a literary text—those powerful moments when a teen takes a stand by taking her own life—opens conversations among young people that go beyond word choice or imagery. But, with the increase in reported diagnoses of depression, suicidal thoughts, and self-harm, we have started to look at these scenes differently. Perhaps such approaches work against the visceral impact of the death by suicide of Ophelia, Emma Bovary, Edna Pontellier, Paul in Willa Cather’s “Paul’s Case,” or Hannah Baxter. When we read these scenes as critically significant, as literary highpoints in a vexed text, as moments of heroism, then what message are we sending to our students? “Pedagogical Suicide” draws on a focused conversation among educators—two working secondary teachers in an MA program designed for teachers, plus their professor—that reconsiders the objectives of teaching a graduate level course on canonical British literature online. Professional educators themselves, our graduate students recognized a growing reckoning with suicide in the daily lives of students, leading to a confrontation with their own professional responsibilities.

Traditionally, literary suicides represent different forms of social instability and threat, while providing a means for characters to assert the depths of their discontent or even pursue a form of escape. In an era that draws much closer connections between education, varieties of media, and student mental health, are narrow “literary” readings of suicide supportable or responsible? At first glance, taking up the thorny topic of suicide in literature might appear as detrimental to the professional lives of teachers themselves. Does teaching representations of suicide result in a kind of death of our pedagogical careers? In the face of such criticism, we have embraced the problem as an essential pedagogical undertaking. Our project draws on a reading of an online, mediated exchange to ask what is at stake when teaching representations of suicide to a new generation of students.

BACKGROUND

When we began developing a new Hybrid MA Program in 2016, we were on the cusp of change as a nation. None of us could quite have predicted the full effects of the 2016

Presidential election; a pandemic that would span more than eighteen months and lead to teens feeling socially isolated and anxious; students locked into their online learning platforms dozens of hours a week; the strain of anti-LGBTQ rhetoric emanating from the highest offices in the nation; the summer of racial reckoning in 2000; or an attack on the Capitol building to begin the year 2021. Looking back, we perhaps seem naive in thinking that students new to the program—currently practicing high school educators returning for a 30-credit MA in order to build credentials needed to be recognized with more opportunities as a high achieving teacher—would find a creative outlet in taking three online, asynchronous courses the first summer they matriculate: a World Canons course in June, and then two Canons courses in July, one that covers the British side, and the other covering the American side.

Working in conversation, the instructors of those two latter courses, English 510 on the British canon taught by Eric Leonidas and English 509 on the American canon taught by Aimee Pozorski, carefully coordinated reading schedules, written assignments, final projects, and even reading lists. However, we hadn't fully discussed the content—the repeated motif of suicide—across so many texts we chose to exemplify or interrogate the “canons” on our lists. Looking back now, we wonder about the impact of spending the entire month of July reading suicides across so many texts in the canon. While the emphasis below falls on one early text, Shakespeare's *Romeo and Juliet*, and the stakes of discussing the suicides of its protagonists, we are now thinking about this in the broader contexts of reading lists that feature suicides in the life and / or works by Willa Cather, Kate Chopin, Ernest Hemingway, Arthur Miller, Cherrie Moraga, Sylvia Plath, William Shakespeare, Virginia Woolf, Edith Wharton, Leo Tolstoy, and Gustave Flaubert, among many others.

Perhaps this raises larger questions about canon and canonicity—and approaches to teaching the canon—that we are not able fully to address here. But we recognize that grappling with these texts comes with a psychic cost. This, in turn, demands a recentering of pedagogical ethics—quite the opposite, really, of pedagogical suicide—that does not simply demand we stop teaching the hard stuff. Rather, it demands that we re-center our questions, build in important frameworks, prepare ourselves for fallout, and become acquainted with our schools' grief and guidance counselors. Further, we enter the summer of 2021 aware of the toll of online learning. What was perceived during the designing phase in 2016 as a well-earned break for teachers who had to report to the classroom every day for ten months, our online, asynchronous course structure may now feel like a burden, a burden added to an intense reflection on literary suicides alongside very real knowledge that our students—both in high school and in college—have struggled this year: a number higher, I am sure, than most of us are willing to acknowledge.

EXCHANGE ON SUICIDE FROM *ROMEO AND JULIET* BLOG ASSIGNMENT

We lightly edited the following exchange for clarity.

MATTHEW GOLCHIN, "SUICIDE: UNCOMPLICATED?" (JULY 6, 2019)

In his reading notes, Professor Leonidas asks "What do you think of Juliet's proposal (to Friar Laurence) to die rather than marry Paris in 4.1?" (1). First, let's just acknowledge that discussing suicide with teenagers is very difficult. As any secondary school teacher knows, there are often at least a couple students in class who have been professionally diagnosed as emotionally disturbed. (And let's be honest, they are teenagers, so they are all disturbed to some degree.) This is why I always stayed away from engaging students in debate over whether or not suicide can ever be justified. They just are not ready. This is what Professor Leonidas fails to fully consider in the following statement from his "Topics and Issues":

When considering whether a text is appropriate for students, I'd like to pointedly exclude anything *uncomplicatedly* moral: a particular lesson, such as respect for others or the value of persistence or don't murder your girlfriend. At some level there's certainly a place for ethical engagement, but that level is much deeper than a "message."

Prof tells us that "In putting this together, I started with a very basic question: What in this text might interest or speak to a young adult, and why?" Ok—so, if that's the driving question of the course, then why hasn't anyone specifically addressed the issue of how to discuss the complicated nature of R&J's suicide with adolescents? Because here is the problem: if you talk to *any* school administrator, they will tell you that given our role as educators in a particular setting suicide *is* uncomplicatedly moral: There is always a better option! Do not be selfish! Do not be a coward! But we all know that suicide is far more complicated than that, as nearly half of Prof's reading notes on Acts IV-V argue that point. In fact, his position is quite clear: R&J were justified in killing themselves. Prof, I mean no disrespect, but try introducing that idea to a room full of freshmen and watch how quickly you land yourself in front of the Board of Education with a union rep by your side.

I'm writing from experience. Several years ago in a senior honors class, I floated the idea that Edna in Kate Chopin's *The Awakening* can be considered a hero for committing suicide. This was the essay prompt: Hero or Coward? These essays were some of the best all year. Students were finally not bullshitting their way through the essay. They intuitively (and in some cases experientially) understood that something was at stake. However, when we return to the question of "what in this text might interest or speak to a young adult, and why?," then we must acknowledge that this question contains complications of its own.

Note: The fallout from the essay prompt did not get quite as far as the BOE, but there was a stern reprimand from the principal. Discussing literature in depth without regard for a "message" is risky business. Sometimes I think we underestimate students' ability to engage at a deep level. For many teachers it just comes down to playing it safe. I never thought I would be that kind of teacher, but who the hell wants to get fired, or be part of some controversy? There is so much liability in secondary education! Yay for teaching at a community college!

ROCHELLE SCHNITZER, "COMMENT" (JULY 6, 2019)

Matt, I think your ideas are interesting, but I have to politely disagree. I believe that it depends on the environment and the school that you are teaching in. I set specific goals for environment in my classroom, and I have yet to NOT discuss Romeo and Juliet's suicide at the end of the play. Students are actually thankful that we discuss it and bring to light the very intense issue that is teenage angst, maturity, hormones, and mental health. I can't even tell you how many teenagers have very deep and insightful opinions on the topic, and since many of them are dealing with mental health issues in the moment, they can closely examine the characters' motives and feelings. Framed in the correct way, the discussion can be positive and insightful without needing a union rep. In the play, the Prince even addresses the suicide by explaining that the family is to blame because they could not overcome their pride and this is essentially why Romeo and Juliet's actions are justified, because their families just cannot get over themselves. The Prince even says:

"Where be these enemies?—Capulet, Montague,
See what a scourge is laid upon your hate,
That heaven finds means to kill your joys with love,
And I, for winking at your discords too,
Have lost a brace of kinsmen. All are punished."

Everyone is punished for their vile behavior, and if you really want to view it as all are punished, then you could apply this to Romeo and Juliet as well. However, the overall actions by these two characters are not something to shy away from discussing for it is essential to the entire message of the play.

MATTHEW GOLCHIN, "COMMENT" (JULY 6, 2019)

Rochelle, You say that "framed the correct way, the discussion can be positive..." What do you mean by "correct way" and "positive"? Already, right there, I see an issue. There is not a single administrator or parent who would support an interpretation that entertained the idea that suicide might be heroic given a particular circumstance (such as that so clearly faced by R&J).

Teenagers may have “deep and insightful opinions on topic” as you say, but eventually the students MUST come to the conclusion that suicide is wrong no matter the circumstance, right? Have you ever had a student courageous enough to defend suicide as an act of heroism? If so, how did you handle that?

It really may just come down to you being a better facilitator of this type of discussion. As for me, I don't want to carry that mantle.

ERIC LEONIDAS, “COMMENT” (JULY 8, 2019)

So, this is all very helpful. That is, suicide isn't all that unusual in Shakespeare: Othello, Antony and Cleopatra, Lady MacB, Ophelia, Goneril, Timon (in the poetry, Lucrece). Hamlet obviously discusses it at length, in the precise terms of heroism. I'm not blind to the fact that suicide is going to be a tough issue in the secondary school classroom—I followed the *13 Reasons Why* controversy.

But in looking at it, I did emphasize the question of “What does it mean?” and not should / shouldn't. So I'm wondering if there's a way to bring this together, to think about the ways the play wrests the suicides away from self-determinative acts and sees them as the “fates” punishing the families. [In other words, can we trace the way that the play—and cultures more generally—understand or fail to understand suicide?] After all, as I've said I'm not against ethical considerations in literature. But if R&J is going to be a lesson against suicide, well, it's going to be tough, since in the play the deaths are clearly an affirmation of love (let's not forget they're in a tomb!—they're *leaving* death through a kind of sexual consummation) much more than a gesture of despair.

Matt, I do appreciate the candor.

RESULTS

Teaching is nothing if not reflexive—equal measures of self-doubt when a lesson doesn't go as planned and belief, knowing that we can always improve. And teaching is nothing if not discursive—the constant exchange of ideas between professors and their students. How fortunate we are in the English MA program to work with students who are themselves accomplished teachers. Our conversations within and across seminars are open-ended, mutually respectful dialogues among colleagues who worry about the impact of their choices every day: choices made in the name of educating our state's young people, of giving them a language to describe not only what they feel in their personal lives but also their growing discontent with what they see in the world at large.

One of the results of the 2019 exchange in English 510 considering how best to respond to the suicides in *Romeo and Juliet* is the following paper topic and prompt for further discussion that Eric Leonidas added in Summer of 2020.

The question is, simply: How, given our ongoing concern for young people's mental health and our broad responsibilities as educators, do we present Romeo and Juliet's suicides?

The longer version is that a former student, who teaches various levels in high school, thought my take on Romeo and Juliet's love as "serious" was impossible for him. He objected especially to my emphasis on the material; I had argued that R&J's need to live immediately and physically—sexually—amounted to a rejection of deferred satisfaction or purely spiritual bonding, a rejection of the material conditions that would dictate whom, how, and when they love. The suicide was thus an important expression of resistance. Such an argument, my student thought, could never be offered to high school students. Suicide is not a symbol, it is not an expression. It is a pressing and immediate problem facing young people, and our message cannot vary from that.

But of course suicide, whether in Shakespeare's plays or other literature, takes its meaning from the textual context as well as its long tradition as a trope in the literary tradition (and, I would add, literary works are a poor vehicle through which to teach mental health awareness). Can we present suicide as a literary element without addressing its real-world existence? Would we really want to?

This isn't something I had really ever thought about, having only ever been a college-level instructor. I'm curious to hear your thoughts. How do you address suicide in literature with young people (there are a number of them in our texts, and then Virginia Woolf herself), and in *R&J* in particular?

DISCUSSION

So much of this narrowly focused exchange adds up to a much larger question about the role of literature and the teaching of literature when discussing with young people the often-provocative representations of racial violence, gender constructs, class distinctions, depression, and suicide. Are we harming our students by avoiding the discussion our canonical literatures seem to demand of us? Are we doing more harm by opening the questions of literary merit and heroic characterization that texts written hundreds of years ago seem to raise for us today? What freedoms do university professors take for granted while the students in their classrooms—educators themselves—need to report to administrators and school boards and follow rigid curricular standards, besides?

Much of the above debate was framed by an insistence that good literature is morally complex. Just as sophisticated lyric and story cannot be reduced to pithy “messages,” a literary suicide bears multiple and perhaps even opposed meanings because of its appearance in a broader narrative. Romeo and Juliet's acts cannot be pulled from the text and forced to join a quantitative or qualitative analysis of adolescent mental health today. The perspectives above seem to acknowledge this. In one teacher's view, a nuanced reading of the play's conclusion is simply impossible given the institutional and social imperative for absolute clarity on the question of suicide; already difficult in its figurative language and seeming cultural distance, the text as object lesson threatens to become all the more irrelevant to students.

At the same time, a second teacher answers, the play affords opportunity to present careful readings and to *listen* to what students say. The instructor points to the ways the play offers its own perspectives on what happens (the Prince, for instance, indicts the families). Perhaps the text finds its relevance in focusing attention on contextualization and the extent to which meaning is generated within distinct “systems” such as literature, fashion, music, architecture, video games, advertising, design, or social media. Suicide in *Romeo and Juliet* may have less to say about mental health in itself and more about human understanding, interpretation, and communication of social phenomena. The play might steer us toward a parallel discussion of how mental health and suicide are represented in culture and why.

Shakespeare himself had something to say about the understanding of suicide. In *Hamlet*, Ophelia is pushed to the brink of madness by the sudden death of her father and by her bewildering (and borderline abusive) treatment by Hamlet. She speaks her grief and distress in complex rhetorical figures. But just before she takes a disturbingly manic turn onstage, an unnamed gentleman appears and “frames” her expressions for us: we are to understand them as meaningless, or at best some disjointed thoughts that listeners construe to fit their own purposes:

Gentleman. She speaks much of her father, says she hears
There's tricks i' th' world, and hems, and beats her heart,
Spurns enviously at straws, speaks things in doubt
That carry but half sense. Her speech is nothing,
Yet the unshapèd use of it doth move
The hearers to collection.

In the notes on *Romeo and Juliet* that were offered to the class as starting point for discussion, students were asked to take Shakespeare's lovers seriously—to at least consider that their love is deeply felt rather than mere teenage infatuation, to reflect on the pair's difficulty in engaging with cultural authorities, and to weigh their deaths as

deliberate acts of political resistance as much as manifestations of despair. These are *interpretations*, to be sure, and so they risk appearing as what the gentleman terms "collection," the assembling of what we see and hear into readings that suit our interests. As tragedy, the play may ultimately be most impactful as a lament over the damage of two suicides. Such an approach at least attends to who Romeo and Juliet are and what they say. And so no matter the conclusion, thoughtful and invested readings importantly avoid reducing the characters' expressions of desire and pain to "nothing." Ultimately, close readings of the deaths may offer teachers an opportunity to convey poignantly the imperatives of adults concerned with adolescent mental health or entry into a larger exploration of how and why young people understand different social phenomena in the ways that they do.

In closing, we recognize that a discussion of literature and mental health in a classroom strays into the domain of disciplines such as education, administrative leadership, psychology, and clinical and school counseling. Faculty and students working in these areas no doubt have valuable expertise to share, and we would love to hear what insight you could offer. How might one approach the topic of suicide in literature, whether from the perspective of a teacher, student, counselor, principal, or parent? What opportunities are there for using literature to explore adolescent mental health, or the larger cultural context in which mental health has become of increasing concern? What do our young teachers (and older faculty) see clearly, and what are we missing? We invite you to continue the discussion.

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Matt Golchin brings 13 years of experience to the classroom, including public and independent high schools in Connecticut as well as the collegiate level. Currently, he teaches Advanced Placement Language and Composition full-time at the Kingswood Oxford School in West Hartford, CT. In the evenings, he serves as a part-time lecturer at Tunxis Community College where he teaches developmental English and Composition. Matt considers his role in the classroom to be that of a community manager who establishes goals, plans activities, provides guidance, and offers support. He believes that teaching is about more than just content. He understands that students will arrive to the classroom with more on their minds (believe it or not) than the lesson he spent all week planning. So, on the very *rarest of occasions* when what matters to students is not his nationally acclaimed “five tips to writing an effective summary” or even his world famous “three secrets to writing a strong thesis statement,” he adapts his lesson to meet students where they are so they can eventually get to where they need to be. In this way, he manages a community of learners who work together to develop reading and writing skills.

Eric Leonidas is Associate Professor of English at Central Connecticut State University, where he teaches early modern poetry and drama. His research focuses on epistemology and the construction of competing ways of knowing in early modern literature.

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THE (ONCE) REMOTE LIBRARIAN: REINVENTING OUR ROLE IN THE FACE OF A PANDEMIC

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ABSTRACT

The onset of the COVID-19 pandemic created an urgent need for the CCSU Elihu Burritt Library to adapt their traditional library services to the “new normal.” Librarians from all departments worked together to find creative ways to maintain a high level of service while respecting safety protocol and work-from-home conditions. At the heart of every decision made was a strong desire to continue serving faculty, students, and staff to the best of their ability, given the circumstances. As a result, the Elihu Burritt Library staff provided quality service to the CCSU community, incorporating the many lessons learned from the pandemic into present day library service.

INTRODUCTION

The role of the academic library has been described most often as the heart of any college or university campus, where students find either the space to work collaboratively or quiet spaces to study and information sources for research papers. Seldom is there pause to consider the many roles of the academic librarian: collecting, preserving, organizing and disseminating those critical and vetted information sources within the educational environment. Within the first few months, in fact, many librarians were asked what we were “doing” with the physical libraries closed. The forced migration to the virtual world demonstrated both the evolutionary nature of librarians in our diverse roles as information specialists and librarians’ pliability in responding to information users’ needs and meeting patrons wherever they might be located.

LITERATURE REVIEW

Many of the electronic communications systems and the digitized information sources were already well in place at the Elihu Burritt Library before the campus closed on March 12, 2020 and only needed to be taught to or used with our students, faculty and staff in order to fully launch virtual services, necessary to keep the library “open” during the pandemic. A literature review conducted for this article demonstrates that the digitized information sources have been evolving for at least two decades. All of this leads to the following actions taken by the full spectrum of roles across the academic library, including those of the library director, information collection acquisitions and serials specialists, information catalogers, information systems specialists, and information collections access specialists. Working together, via various virtual

platforms, to deliver a consistent level of excellence in service is the trademark goal toward which we endeavored.

In 2000, William Arms defined a digital library as “a managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network.” The order here is important: in Arms’s definition, the collection is the priority, and services come second. This definition has been constant for most of the past 20 years, and much of the discussion on digital libraries has focused on collection development and marketing (Perrin et al. 2017), technologies for the storage and organization of digital collections materials (Raza & Warraich 2019), and the potential for collections to serve as a form of data (Wittmann et al. 2019).

In recent years, with universities’ increased adoption of online and hybrid instruction, digital libraries have come to be seen not just as content providers, but as “significant agents of transformative learning” (Owusu-Ansah et al. 2019). This has led to more focus on the role that digital libraries may play in supporting new models of instruction such as the flipped classroom (Green 2019; Jian 2019) and new emerging disciplines such as the digital humanities (Mourer 2017; Hauck 2017). Digital libraries also facilitate instructors’ use of open access teaching materials (Salaz, Johnston, and Pickles 2018) and play a role in making learning more accessible for disabled students (Moorefield-Lang 2018; Cho 2018). The use of virtual reference services via chat has also expanded greatly (Hervieu and Tummon 2018; Car et al. 2019).

With the rapid shifts to online instruction and other library services as a result of the COVID-19 pandemic, the notion of a “digital library” has completed its transition from a collection of digital objects to a fully functional virtual workspace for both the student and librarian, where a range of library services are performed online (Masey 2020; Walsh & Rana 2020; Gottschall et al. 2021; Howes et al. 2021). Academic librarians responded to the shutdown of their physical environments in a number of innovative ways, promoting expanded digital access to materials (Pokorná et al 2021), integrating with instructional faculty’s learning management systems (Temiz & Salelkar 2020), using social media to communicate with patrons (Chaputula, Abdullah, & Mwale 2020), and producing videos and Libguides to assist students (Matteson 2020). Here is our story.

BUSINESS NOT AS USUAL

Communication

While much was in flux during the pandemic year, one fact remained constant—the library would remain “open,” whether as a fully remote library during Spring 2020, providing limited on-ground and expanded online services (Summer and Fall 2020), or in its present day iteration. Decisions about how to transform what was previously offered on-ground into a virtual environment as well as how to safely open up the

physical library building were made after extensive planning and careful consideration by the Library Director in consultation with library personnel, staff from campus facilities, and public health officials. To communicate this moving target of services, an extensive online [Library Services Guide](#) was created and has been updated in real time as situations change to answer inquiries from our valued patrons. The guide includes information on building hours and on-ground resource availability; how to request books, course reserves, items through interlibrary loan, and special collections and archives; and dedicated service pages for students, faculty/staff, and the public.

E-Resources

At the onset of the pandemic, many vendors expanded their digital collections to accommodate for the lack of access to print materials in the now closed library. The E-Resources Department worked with vendors to expand these collections and market the material to faculty and students. As a result, the library included two new platforms, Redshelf Responds and VitalSource Bookshelf, which increased access to online textbooks. The E-Resources department also negotiated an increase in eBook collections, including 48,000 titles in eBook Central, and 20,000 titles in JSTOR, along with numerous university presses. Several of our databases, including Academic Search Premier, Business Source Premier, Wolter Kluwers Health Resources, and HeinOnline, also expanded their collections, adding thousands of journal articles. With fully online classes and a lack of access to DVDs in the library, we saw an uptick in requests for streaming videos and films; in response, titles were added to Kanopy, Films on Demand, and Jove Science Videos.

Access Services

Access Services, by virtue of the department's functional responsibilities, has an extremely hands-on presence in the Burritt Library. This department provides access to the physical collection through patron borrowing, sharing items with other libraries, moving materials to course reserves, and maintaining the physical layout of the collection. Transitioning to an online environment was a challenge. Many services came to a halt the day the building doors closed; however, opportunities for growth were waiting for us. Two initial priorities were to support students as they located materials online, whether course reserve textbooks or articles for their research, and faculty as they pivoted to online courses. Complicating our response, however, was the closing of "the library resource sharing world," meaning the possibility of sharing materials with others in the CSCU system came to a screeching halt due to COVID restrictions. In fact, consortia lending in our library system was turned off to stop the possible requesting of materials since there was no safe way to receive materials, get them to patrons, or physically locate materials to send to others. The decision was ultimately made to only lend content available electronically such as articles from the library databases. In the interlibrary loan world, to lend is to borrow; in other words, the system is based on

reciprocity. Many libraries who initially 'closed' for the pandemic eventually opened back up after the first few weeks when they realized they could continue to send their e-content. The more libraries that remained open meant access to more materials, which in turn made our job easier in attempting to locate materials for our CCSU family.

Online library hours were reduced from our traditional 84 hours per week down to 72 hours per week. Once the new schedule was approved, Access Services staff was employed in chat, creating a virtual circulation desk to help cover those hours to answer questions as needed. The next step was to begin planning how to manage the physical materials that had been previously loaned out to our patrons, especially students, pre-pandemic. Decisions were made with the intent to help students who were facing many financial and emotional hardships. As such, we extended due dates, waived overdue fines, and continued this leniency throughout the pandemic. The Library Director and the Head of Access Services worked with Facilities to publicize the book return at the back of the library in the hopes that as many students as possible would return their overdue materials. We received many books, both for the bookstore and the library, through the end of the spring 2020 semester.

Reference Services

As in-person reference services ceased on March 13, 2020, online chat services for helping patrons continued using our previously established software for handling electronic chat queries, LibAnswers from Springshare. However, the added feature of being able to share screens with patrons and demonstrate where and how to find information and use library services provided new opportunities to serve students from both off-campus and on-campus locations. Patrons' abilities to share their screens has added value to reference services by increasing student engagement with the research process, instead of simply providing information via text. Though students may not have been as familiar with the chat service in the beginning of the pandemic, awareness grew through concentrated marketing, which increased usage. By April of 2020, 32 students used the chat tool to ask reference questions, while only 12 students/library patrons had used the chat tool in April of 2019 (almost triple the number). By December of 2020, 267 reference queries/transactions had occurred using the chat tool since the beginning of the pandemic. This was four times the amount of reference queries through the chat tool that had occurred over the same period in 2019. It is likely that this trend will continue due to a student preference for online chat services and tools that work with their day-to-day lives, indicating an increase in usage in the 2021-2022 academic year and beyond.

The Book a Librarian service had been introduced in late February of 2020 as a Student Retention Grant project and was originally intended to serve first-year students in the composition class sections to provide research assistance from the Reference and

Instruction librarians as part of the embedded information literacy program with the WRT105/110 program. Although the concept of offering one-on-one consultations to library patrons is conventional to any library, the grant money provided the equipment and furniture to create the unique space necessary to conduct effective research consultations. An important element for the Book a Librarian service was setting up an easy way for students to schedule appointments with the librarians. Hence, the Bookings software with links for students to request consultation appointments was selected and established for the service. Before the program was rolled out, the stations had been used for student consultations, and the service also had already been extended to upperclassmen, faculty members and visitors before the campus was evacuated in March. A link to the Bookings page was placed on the library's home page before the roll-out of the program. Once the library transitioned to the virtual environment, marketing of this service went into overdrive and students in the WRT105/110 - Introduction to College Writing sections, upperclassmen, and many of our Nurse Anesthesia doctoral students began to request appointments. In fact, the number of requested reference appointments before either the pandemic or the Book a Librarian program began was at a dismal rate of one appointment every two months. Between March 30 and June 30, 2020, 19 reference appointments were booked. Although the majority of these appointments were booked for first-year students in the WRT105/110 course sections, the Book a Librarian service has included as many queries from upperclassmen and graduate students as it has first-year students in the composition classes.

Library Instruction

It is likely that librarians have provided instruction on how to use library resources, identify research topics, construct search strategies and key concepts and cite their research sources in papers for (at least) as long as school libraries have existed (the American Association of School Librarians was founded in 1914). The contemporary information literacy concepts were introduced by the Association of College and Research Libraries in 2015 and adopted by academic instruction librarians in 2016. The framework of concepts include scholarship as conversation, research as inquiry, information as value, and searching as strategic exploration, all of which become increasingly important with the evolution of the digital library. The fallout of the evolution of digitized information translates into information overloads, devolution of authority in the distribution of information, increases in plagiarism with the easiness of cutting and pasting text electronically, and more. Therefore, it is critical to educate students about how to effectively process, find, evaluate, and use information, and the instruction librarians have provided that necessary instruction via library research workshops for decades.

When it became evident that information literacy instruction would remain virtual for the foreseeable future, the Reference and Instruction Department modified the primary method used by faculty to schedule time for their classes with instructional librarians, the Faculty Instruction Request Form. The request form was primarily designed to book in-person librarian visits. The new [Request for Online Library Instruction](#) form showcases the online support services instructional librarians are professionally trained to offer including joining synchronous classes via Webex, Collaborate, and other platforms and creating online learning tools such as how-to videos, research guides, and pathfinders that might be delivered by librarians, academic faculty, or accessed asynchronously by students. These services are crucial to support faculty's pivot to online teaching and students' continued academic success during this unprecedented time.

The Reference and Instruction Department taught a total of 63 library instruction sessions/workshops for the 2020-2021 academic year. Although this number is diminished by about 50%, anecdotal evidence suggests that the faculty members and students were happy with the outcomes of the online instruction because of the virtual environment in which the students must now conduct the bulk of their research. The virtual environment has also allowed faculty members and librarians to record synchronous class instruction for those students who are absent for the library instruction sessions or for those students who wish to review the instruction at their convenience and throughout their research process.

Librarians also communicated changing services and restrictions through video tutorials that were easily shared through the website and the Library Services Guide. This was particularly important for our most basic services at the point of campus closure. Reminding faculty and students about how to access the library through the website was a priority when campus went fully remote in March. Using Kaltura, MediaSpace, Camtasia, and iMovie, several librarians put together important and easy-to-digest tutorials on library services. [An Introduction to the Elihu Burritt Library's Website](#) addressed that initial need. Soon after came videos on [Digital Course Reserves](#), an overview of the website geared towards New Faculty for the [New Faculty Orientation](#), and a video on [Curbside Pickup](#), which explained how students and faculty could get physical items from the library.

Information Systems & Resources (ISAR)

Library services such as cataloging, digital support, and technical support comprise the department Information, Systems, and Resources (ISAR). The department's staff includes two Catalog Librarians, a Digital Resources Librarian, and a Library Technician. Most all our department's tasks, with a few exceptions, were effortlessly converted to a teleworking environment during the shutdown. ISAR continued our mission remotely during the campus shutdown, and then onsite and remotely when the library partially

reopened. In addition to our department's usual tasks, some priorities were shifted, and some new roles were acquired in order to support the new library environment.

Unable to work onsite, the cataloging and processing of the library's physical materials ceased during the shutdown. However, the shutdown provided an opportunity to focus on tasks that could be worked on remotely. Tasks such as inventory maintenance in the catalog, the cataloging of electronic materials, and the processing of the library's digital collections were readily accessible remotely and continued to be worked on during the shutdown. The processing of physical materials resumed when the library partially reopened and our catalogers were able to work onsite.

During the shutdown and partial library reopening, the Digital Resources Librarian provided continuous remote support for the library's website, blog, servers, and back office systems functions. They worked closely and quickly with the Reference and Instruction Department to provide updated library services information, chat functions, and interactive forms to post on the library's website.

As an onsite troubleshooter for the library's computers, printers, and other equipment, the Library Technician's task priorities were rearranged when the library shut down. With the library closed, most of the library's equipment was no longer in use. The Library Technician worked remotely monitoring emails from library staff and the university's Information Technology Department and providing remote assistance as needed. They also worked closely with the Digital Resources Librarian on testing website functions. When time was available, they used the shutdown as an opportunity to attend freely available online training from [ABLE](#), the [Data Literacy Project](#), [Software Carpentry](#), and [Library Carpentry](#). When the library partially reopened, the Library Technician resumed onsite tasks.

In addition to their usual duties, ISAR staff gladly stepped up when asked to help in other departments and with other projects. The Digital Resources Librarian assisted with Help Desk coverage for the Center for Teaching and Innovation (described below). In May 2020, the Catalog Librarians worked with the Office of Academic Affairs to code campus surveys regarding models of hybrid and non-hybrid instruction. After the library partially reopened, the Library Technician assisted at the Circulation Desk one to two hours per day, as needed. When it became apparent that the vacated Acquisitions Librarian position would not be imminently filled, one of the Catalog Librarians learned the basic necessary tasks to carry out the duties for this position. Department flexibility and collaboration contributed to the continued successful operation of the library in the fully and partially online environment.

Collaboration with the Center for Teaching and Innovation

Responding to the surge in requests from faculty to learn new instructional technology, maximize their use of Blackboard, and transition their on-ground courses to online, librarians volunteered to expand their chat service to include faculty inquiries to the Center for Teaching and Innovation (CTI) (formerly the Instructional Design and Technology Resource Center and Center for Teaching and Faculty Development). The small library team of four covered over 700 hours of chat for CTI from March through August 2020 as well as spending time in software training sessions and self-studying to respond as effectively as possible to some of the complex inquiries that CTI professionals receive on a daily basis.

In addition, the library had been collaborating with the CTI on faculty book discussions which involved helping to distribute books on teaching topics, assisting in hosting group meetings on campus, and uploading discussion notes into Blackboard. After leaving campus, we were able to continue this collaboration without skipping a beat. There was a slight modification to the process in that all discussion sessions were now conducted virtually through Teams or Webex, books were provided in a digital format, and topics shifted to events reflecting the unrest that defined 2020 such as Robin DiAngelo's *White Fragility: Why It's So Hard for White People to Talk About Racism*, co-sponsored by the Office of Equity and Inclusion. The shift to online did not diminish the spirit and importance of these book discussions.

OER Teamwork

As might be expected, pre-COVID efforts by the library's open educational resources (OER) team were energized in 2020. The OER team of three librarians delivered a Center for Teaching and Innovation Lunch and Learn session during the Summer and a consortium-wide presentation at the Fall OER Summit on finding, evaluating, and creating open access resources. Librarians have always been available to collaborate with academic faculty to conduct searches to fill in gaps in course materials including textbooks, videos, supplemental teaching materials, assessment tools, advise on licensing and copyright issues, add OER to the library's digital collection accessible through the online catalog, and more. The shift to remote learning provided a renewed focus on these services. To help further spread the word, the team created an *Open@CCSU* newsletter, which generated additional requests from faculty from a variety of disciplines.

THE REOPENING

Access Services

Beginning in the spring 2020 semester, the library director and the heads of Access Services and Reference sat down to begin working on a reopening plan. This included decisions on hours (both online and on-ground), staffing, a redesign of roles for the staff

members returning, plans for quarantining materials, how to handle course reserves, and a redesign of the physical space in the library building.

Creating our 'Curbside pick-up' of physical materials became the first task for Access Services. We were allowed to keep the book stacks closed, so the request option in our online catalog (Alma Primo) was turned on to allow CCSU patrons to place requests, which would then be quickly pulled by Access Services staff. The requested items were then checked out to the patron and packaged with the patron's last name, first initial and date and left on a table inside or outside the library, weather permitting, and could then be picked up by the patron. This service has allowed us to keep staff safe as they worked in the stacks and most importantly, it kept the materials in the stacks accessible. We have been pleased with the use of the service since we opened it in August 2020, processing over 900 orders. Almost half of the orders were from students (496), with faculty and staff requesting over a third of the total (355). Faithful community borrowers added to the totals (77).

The next hurdle was figuring out access to the physical course reserves that are shelved behind the circulation desk, including the Textbook Collection, which are textbooks purchased through donations to help support student learning. During normal times, these materials are used for short periods of time by multiple patrons over the course of a day. COVID-19 risks and restrictions made this kind of service impossible, especially given the need to quarantine returned materials for up to three days, making them highly inaccessible to students. It made more sense to restrict the number of hands on the materials to staff only, so ILLiad, our Interlibrary Loan management system, was used for document delivery scans of chapters as needed. We have processed over 307 such requests over the academic year 2021. Once the stacks reopened in the fall of 2021, the traditional borrowing of these short term loans resumed and scanning has ended.

Facilities helped library staff configure new study areas. A whole new pattern of movement was created for the building with staircases designated as "up" or "down", allowing for social distancing while moving through the building. During the fall 2020 semester the stacks were still off limits to students except for a small area in stack 3. A few more areas in the stacks were opened for student use for the spring 2021 semester to give students more spaces for studying and taking online classes.

The fall 2020 semester brought fewer students back to campus, but the need to get materials to students remained, whether they were on campus or home. To further support their research needs, the Access Services department worked to provide faster access to online articles through Interlibrary Loan. Early in the fall of 2020, the Universities in CSCU consortium of libraries joined Rapid ILL. Rapid ILL is a peer

oriented interlibrary loan system that leverages technology and tools to streamline article borrowing and make the process faster. We went live with borrowing in October 2020 and have processed over 1,170 articles through this new system.

Special Events

Even though the physical doors were open, the question of what to do about group events remained. For example, every Fall, the library holds a Trick or Treat event where students are introduced to many of the library's electronic databases and resources—including the 3D printers and citation managers—and taught tips and tricks to using these resources for their class assignments. This allows library staff from public services, electronic resources and technical services departments the opportunity to engage with students in a friendly and informal way, helping to create connections that will boost students' confidence in approaching librarians for assistance and making for a friendly and positive experience that will ultimately improve their academic/research success.

Although replacing the carnival-like atmosphere of the library's eResources fair/Trick-or-Treat event was a certain impossibility, the E-Resources librarians decided to transition to online and the Reference and Instruction librarians provided six free virtual presentations each week on one of four new and/or popular electronic resources to students and community members. Among the offerings for this virtual event were demonstrations of e-books, HeinOnline database, Mendeley citation management system (one free replacement for RefWorks), and Zotero citation management system (another free replacement for RefWorks). Attendees were registered for a raffle drawing for gift certificates to Dunkin Donuts and a grand prize of a \$100 gift certificate to the bookstore. In addition to the live demonstrations, library guides for each of the e-resources were also posted to the library's website for future reference. These guides have been used continuously since their publication in the fall of 2020.

We also continued to respond to requests for library participation in campus events for prospective and new students such as the Graduate and Undergraduate Open Houses. While typically we would set up an attractive booth with giveaways, instead we created various online materials and hosted "virtual rooms" on the days of the events.

Social Media

The start of the fall 2020 semester also provided librarians with an opportunity to inform students about library services in the pandemic by posting video tutorials to social media. Bringing students back to campus meant another wave of information for students and faculty on how to use the library and get help with research amidst new restrictions. A quick 60 second tutorial on the 'Book a Librarian' program was posted on the library's blog, Facebook, Instagram, and Twitter, and then later re-shared by CCSU's

Student Affairs and the CCSU official Instagram accounts. The library's Instagram account logged 70 views, 5 likes and a comment from one student who said they had no idea this service existed and looked forward to using it. Building on that success, librarians created a second video for social media welcoming students back to the library for the spring 2021 semester. This video received 91 views on the library's Instagram, 5 comments, and 12 likes, indicating an increase in activity to the library's account, and therefore demonstrating that vital information reached students. Librarians are already planning to use this method of communication in conjunction with other established methods beyond the COVID-19 pandemic to continue effectively promoting library services.

Special Collections

The Library Special Collections department is physically located on the second floor of the Library and takes care of rare books and archival materials. Archival holdings are included in three distinctive collections: University Archives, Connecticut Polish American Archives, and GLBTQ Archives. These collections support the curriculum of many courses offered at CCSU and provide important research materials for students, faculty, and outside scholars. Like other Library departments, their every day work flow was severely altered this past year and some lessons for the future were learned. Limited personal contact and numerous restrictions on sharing materials taught us that we need to speed up the process of digitizing materials so everyone can have better access. The benefits of digital libraries goes far beyond the world of researchers and students. Digital libraries help preserve our cultural heritage and allow us to share this with people throughout the world more easily.

The shift to digital archives has become a necessity that will shape how we learn, teach, and work. However, digital technology with its constantly changing software and hardware presents challenges to libraries and their budget. We therefore need to collaborate with local, national, and international organizations by sharing tasks and costs.

Selected materials from the Burritt Library rare book and archival collections continue to be digitized and uploaded to the Connecticut Digital Archives (CTDA). This greatly improves access to these materials.

The increased demand for scanned materials during the pandemic has motivated us to improve our in-house digitization efforts, however additional new technologies and hardware needed will be essential for continuing these tasks.

A Digital Humanities Lab, a crucial need that is now becoming a necessity at CCSU, will be beneficial to the Library in its preservation and access efforts and, in collaboration

with the Connecticut Digital Archives initiative, will help CCSU students and faculty explore and learn from important digitized materials.

CONCLUSION

Though our methods may have changed over the last year, our mission remains constant. We are here to serve our students and our faculty to the best of our ability, meeting them where they are and adapting to the numerous changes. While this pandemic was not normal for anyone, how we responded as librarians was very normal. Being a librarian means always finding ways to embrace challenges, new technologies, and changing paradigms to reach our patrons at their point of need. From where we now stand a year later, a concrete truth about the library is that it is not just a place that stores information, it is also a group of librarians working collaboratively every day to provide the services, both seen and behind-the-scenes, that help keep Central Connecticut State University moving towards success. We will continue, as we always do, to innovate and reimagine as we head into whatever may follow this trying time, utilizing what we have learned along the way.

EPILOGUE

At the time of this writing, CCSU is approaching the halfway point of the Fall 2021 semester, and the library has transitioned once again to meet the needs of students and faculty across campus. With the introduction of vaccines, careful planning, and masks, the Elihu Burritt Library can open its doors and its stacks once again to the university 84 hours a week, and provide needed services to help students thrive, while holding on to some of the lessons learned during the height of the pandemic.

Access Services received such positive feedback about patrons being able to request CCSU materials to be pulled and brought to Circulation for pick up that the service continues to this day. Now patrons can visit the Circulation Desk and check out the items themselves, as opposed to picking them up inside the door and then leaving, thus encouraging some actual interaction! Course reserves are back to pre-pandemic times, letting students use physical copies of textbooks in the library and therefore meeting the needs of students who rely on these materials.

ISAR (Information Systems and Resources) seamlessly pivoted back to their onsite presence with no disruption in service. All online systems such as the library management system, digital repositories, and website, continued to function and be supported as usual during the shutdown and after the full return of staff to campus. Once fully staffed onsite, the processing of physical materials for the library's collection

was able to resume to pre-shutdown levels, ensuring the library's materials, both physical and digital, are available.

The Reference and Instruction Department has returned to in-person teaching for one-shots and embedded library sessions. To respect the social distancing protocol, librarians teach either in the Library Classroom or travel around campus to visit the classes in their original classrooms. The Reference Desk is no longer only virtual, librarians have returned to staffing the desk on the second floor of the library, but continue to maintain a chat presence, due to its popularity during virtual semesters. Additionally, the department has instituted a series of workshops called "Research on the Run" to help students with some of the more common questions about research. These workshops are held on Wednesdays in a hybrid format, to make them more accessible for all students.

In all that the library does, students remain the central focus. As the world slowly reopens, the library will continue to evolve and adapt as situations permit in order to help the CCSU community succeed. There were many lessons learned during the pandemic, but perhaps one of the most important realizations is that the library has the capability to be fluid and dynamic as needed in order to support its most important patrons—the students.

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Martha Kruy, MLS, MFA, is a Reference, Instruction and Assessment Librarian at Central Connecticut State University. She specializes in teaching information literacy in the online environment, as well as assessing the broad variety of instructional delivery methods used by librarians and has co-authored a chapter in volume one of *Teaching Information Literacy and Writing Studies*. She co-founded the Connecticut Information Literacy Conference with Dr. Carl Antonucci in 2011, which she has chaired or co-chaired three times. She has co-chaired the CCSU Academic Assessment Committee twice and actively participates in the overall assessment of Elihu Burritt Library.

Brian Matzke is a Reference & Instruction and Digital Humanities Librarian at Central Connecticut State University. He teaches and provides consultation services on library research, information literacy, data visualization, website design, and digital archiving. He helps oversee CCSU's Veterans History Project, which records, preserves, and shares oral histories of Connecticut Veterans, and he helps manage CCSU's collections in the Connecticut Digital Archive. He also teaches a three credit course, DH100: Introduction to Digital Humanities.

Jillian Maynard is a Reference & Instruction Librarian at Central Connecticut State University. She works with students and faculty to enhance information literacy skills across the CCSU community, through teaching one-shot library sessions and a section of the credit-course, LSC150: Research in the Digital Age. She also helps oversee the CCSU branch of the Veterans History Project, whose primary objective is to record, preserve, and share the oral histories of Connecticut Veterans from all wars. Jillian is also a part of the OER (Open Educational Resources) Library Team, tasked with increasing awareness and adoptions of OER on campus. She has presented on

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Susan Slaga-Metivier, MLIS, is head of the Reference and Instruction Department at Central Connecticut State University Elihu Burritt Library. She teaches information literacy and oversees the Elihu Burritt Library Research Awards. She wrote a chapter in *Teaching Non-traditional Learners: Tools for Creative Instruction* and has co-authored a chapter in volume one of *Teaching Information Literacy and Writing Studies*.

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REFLECTION: SUPPORTING INSTRUCTIONAL TECHNOLOGY DURING THE COVID 19 PANDEMIC

MINA HUSSAINI

While I promise it's not ALL bad, I must start there. I was first brought onboard as an emergency hire early in the COVID-19 pandemic. There is already too much to take in as an emergency hire in general, but having the role of directly supporting anxious faculty and staff with technology that I'd never even heard of was that much more difficult.

Let's start with the HyFlex training. I had to familiarize myself with the different pieces of technology in the classroom, including the Crestron control box, which I used to just call "The Christopher" because I had a hard time keeping track of all the new terminology. I promise I don't call it that anymore. Then, I had to teach myself the ins and outs of Kaltura Classroom, the broadcasting tool we use to teach lectures live, and reorganize that information into a step-by-step process that faculty and staff could follow. We designed workshops that could be run both in-person and online as well as training manuals and videos. These workshops were then communicated to all faculty via email inviting them to register as soon as possible. Many did, with some even attending multiple sessions, which was encouraging.

But once all the workshops were completed, and the semester had begun, we found that some individuals were walking into the classroom on the first day and, upon seeing the technology for the first time, panicked. Our 3-person team had to stop in our tracks, run across campus and deliver on-demand crash-courses while students were waiting for their lecture to begin. But the stress was just beginning. Kaltura experienced a national outage several times in the first two weeks of the semester due to capacity issues, as universities around the country were also trying out THEIR systems for the first time. Tempers sometimes flared, but it wasn't our fault – promise!

On the flip side, there was so much growth and gratitude! During my HyFlex workshops, I observed instructors walk into the room with dread and uncertainty and then watched them leave the workshops with excitement and confidence, similar to how I did on my first day learning the classroom technology. Many instructors showed a great amount of appreciation for our support and it was very encouraging. One instructor would repeatedly say that I should really consider becoming a Clinical Psychologist.

The severe pressure put on us by the pandemic forced many of us to also break old habits and reevaluate what we were doing in our courses. I saw some instructors

changing their syllabi after a decade or more of comfortable consistency. Instructors were also coming to us for suggestions on how to address the increase in online cheating. While online cheating continues to be a challenge, faculty have advanced significantly in their understanding of how to monitor against it as well as design assignments to prevent it. The circumstances presented by the pandemic created a new thirst for change and creativity.

I witnessed faculty, staff, and students all face unexpected struggles during the transition to online/HyFlex learning. Those struggles are what have made us a stronger institution and more innovative thinkers. We survived this challenge, and our faculty, staff and students are better prepared for the next one. And I will never forget “The Christopher.”

Mina Hussaini recently graduated with her MS in Technology Management from CCSU. She joined the Instructional Design & Distance Learning Development team in June 2020 and is very happy to have joined during a crucial time where the pandemic presented many new challenges for students and instructors. Teaching and helping faculty with various technologies is very rewarding to her because she enjoys seeing them conquer their fears and feeling empowered to learn more.

ALIENS BUILT THE PYRAMIDS! (AND OTHER DISCOVERIES VIA COLLABORATE CHAT)

SUSAN GILMORE

We're halfway through our online synchronous Fall 2020 semester of English 211: American Lit. II, halfway through our class devoted to Harlem Renaissance poet Langston Hughes, halfway through our consideration of "The Negro Speaks of Rivers" (1921), Hughes's stunning poetic reclamation of continents and centuries full of African and African-American civilization-building achievement. We've arrived, if not at the threshold of revelation, then at one of those peek-inside tiny house portals of insight that poetry provides.

"I looked upon the Nile and raised the pyramids above it." Hughes packs so much suffering and strength into this line, and I turn my students' attention to it, vamping questions through my students' now-bearable silence: "What does the reference to the pyramids do for you? What do we need to know about those pyramids? Why does the speaker say, 'hey, you know those pyramids? I built them.' I would like to see them in person, wouldn't you? Why are people so interested in the pyramids? Why are they a tourist attraction? And who built them?" The response comes via chat, and its usual lagtime this time is deliciously comedic: "people think aliens build them." I read it aloud with a surprisingly girlish-for-my-years giggle in my voice.

That I can laugh and my students laugh with me at this point in the semester shows how far we've come. I'd spent the summer wind-up to our first full online semester immersed in a rolling panic, determined to attend every online training session our university offered and master at least one platform well enough to keep my fall courses afloat. I scolded and cajoled myself, "it's not rocket science," (a cliché I've a right to, knowing the difference first hand from my Apollo guidance systems, rocket-scientist dad) and set a course for my courses using Blackboard Collaborate. Come September, my crew of faceless and voiceless students knocked my usual orbit around our course's bright shiny literary stars and planets off course, at times seemingly into the void. I'd have to wait till spring for more steadily visible and audible participants and then only a few: a make-the-most-of-it forty-something returning vet, a newish mom seeking adult faces, and my in-his-element advisee, whose pert-eared dog became our de facto mascot.

Silence is hard for me, coming from a culture and clan in which conversation is constant, semi-competitive, and, ideally, overlapping. The wait that typed chat conversation entails sends me grasping for my graduate school teaching mentor's count-to-ten rule. Collaborate gaps feel more like count-to-one-hundred. If the pauses are pregnant, then these must be expecting triplets! I fill them with mission control and rodeo theatrics:

“howdy,” I drawl, and, radio “come in class.” My students type back congenially, and by midsemester we’ve reached a comfortable rhythm and rapport, ready for anything, including the comment on aliens that leaps off the chat like headlines off checkout lane copies of the *Weekly World News* and gets my students talking out loud at last.

We establish that by “aliens” my student doesn’t mean foreign slave laborers but something closer to if not exactly little green men. I think of the 1984 film *Brother from Another Planet*, which bridges this people-think theory and the poem’s historical likelihoods by casting its alien brother in Hughes’s colors. I mention teams of heavy-lifter scientists on *Nova’s This Old Pyramid* hauling stones, building mini-monuments, and marveling at their ancient forbears’ prowess. “Aliens” doesn’t seem quite so farfetched beside Hughes’s speaker, whose lifeline rivers supernaturally from Mesopotamian dawns to modern Harlem, and whose voice articulates diasporic belonging and difference. Atop Hughes’s poetic pyramids, we find places where history, fantasy, and our scattered class can meet.

It’s easy to lament what we lost going online but better to note what we gained and might retain. Chatting on Collaborate, we discovered new writing rhythms, new participation modes, and new research routes. (Spring semester, Hughes’s same poem led one student to post chat links to Talmudic debates over the identity of the pyramids’ laborers.) Chat is not without its hazards. Delays lead to non sequiturs that can lead, in turn, to signals-crossed misreadings and affronts. Our class engaged in collective troubleshooting, boosting chat etiquette by using tags to link posts and replies. At their best, our chats generated a kind of halting, liberating chaos. Simultaneous, everyone-typing-at-once chat meant no hanging back, no waiting for the one gung-ho front-row classmate to carry the conversation in our row-less, virtual room. The learning curve was steep—like a pyramid, with curses to dodge and treasures within. Online, however alien the means, we found community: present, learning, building together.

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THE CHALLENGE: ENGAGING STUDENTS DURING COVID-19 - A REFLECTION FROM CCSU

MITCH CHARKIEWICZ

On March 12, 2020, CCSU went into quarantine from COVID-19, which impacted everyone related to campus life in any form. What did we experience? How did we react? How did we find a way to move forward? This is a reflection from my experience during that period.

COVID-19 was the unseen enemy. CCSU is but a microcosm of the world that was severely impacted by this dreaded virus. At CCSU, all in-person classes halted immediately and were thrown into an online environment. The campus was deserted. All teaching professors were faced with a series of new challenges. The first challenges were: 1) How to conduct your classes online as well as 2) Re-establish contact with each of your students. Most of the students were residents of Connecticut and moved back home. Other students were from out-of-state and from other countries, all of which faced their own restrictions upon travel and living conditions.

Communication was key, at first. How would CCSU conduct classes during the quarantine? My first objective was to reach out to each of my students to re-establish contact, then maintain that contact during the remainder of the semester. Some students were easier to contact via email and responded with their own questions about how to continue. Other students were in difficult situations, some without Internet or a device, a couple became homeless which heightened the urgency to keep communications open, always. All were scrambling for answers to their own questions. Engaging each student, reassuring them, trying to direct them to find resources both from campus as well as off campus were important in the beginning.

CCSU provided quick sessions in learning how to teach online to us all, choosing from Blackboard Collaborate, Microsoft Teams, WebEx, or Kaltura, as they were the first to rollout. I tried all and found that each had its own idiosyncrasies with some working better for some types of classes or even with different disciplines. My choice was to use Zoom with my MPOW headset from home. For me, the quality of audio, video, and whiteboard worked best for my courses in Economics. That semester, I produced about 40 videos to place onto my Blackboard shell for students to join synchronously, if possible, or asynchronously when necessary. Keeping the videos both synchronous and asynchronous was key, as students all had various constrained environments to try and work from. All assignments were of one week duration to allow for flexibility and the best time management possible under these conditions.

Students were under stress, concerned and even frightened by COVID-19. It impacted their family, their CCSU environment, as well as work and travel. Some students faced competition for devices and Internet time, so extreme flexibility was needed to provide the path for the successful completion of my courses.

The very first classes were key for the students in reassuring, re-establishing communications, helping in making them comfortable in this new environment, so I invested time so they could at first listen, then watch, respond then learn. Engaging each student helped to calm things down, get them on a positive track and motivate them to continue until completion. Those first thoroughly prepared first classes set the tone for the remainder of the course (Foster & Hermann, 2011).

Students wanted to be engaged as they faced a new condition caused by this virus that, as a result, had removed human interaction from their daily lives. I found that many more students wanted to now have a deeper understanding and thus have a deeper thinking and learning experience in my course. This became an environment from which to foster and support students.

2020 was also an unusual environment in the USA, not only with COVID but also politically. Since Economics, particularly Macro, looks at the overall economy, students were curious as to how the politics would play out. Seeking to promote a civil learning environment, while I had basic guidelines ready, I wanted the class to establish their own guidelines, so that they were engaged in decision making, taking ownership, to some degree (Knepp, 2012). With a diverse class, this allowed for open questioning and discussion. Class participation was robust, as never before. The added benefit was that those students who may have been underprepared for class were drawn into the class even more.

I have always found it to be a challenge to encourage and engage those students who do not seem to prepare for class nor participate. My Micro class gave me an unusual opportunity to bring in those students, as all students were vitally concerned with the virus, masks, social distancing and the developing news on the first vaccine, which would become Pfizer. Each student was voicing their concerns, belief or nonbelief in the use of masks and social distancing, such that this discussion of weekly news events propelled our class into discussions relating to supply and demand of masks and ventilators, later the costs of production for each type of health product related to the virus, lastly the consideration of Pfizer as holding a monopoly position with their vaccine (Brookfield, 2015).

While newsworthy core material discussions were important with the class, it was also necessary and beneficial to allow each student to explain their own reasoning (own

story) so that the class could have a better understanding of each person's viewpoint. Enabling this diversity in this contextual manner led to highly productive and informed discussion all while embracing diversity (Banaji & Greenwald, 2013).

The feedback from students ranging from their ability to connect (or lack of) with the class, their stressors, fear of returning to CCSU in the fall, return to work and financial fears all impacted my responses and preparation to teaching. I kept Zoom Office Hours, kept emails flowing, tried to establish contact with each student at least weekly, listened to them and then responded. Students did want someone to listen. Not knowing if other professors were in contact or if CCSU was responding to them, I just listened to them and directed them to appropriate resources on campus (Goodwin & Miller, 2012). I also began to try expanding from emails messages to audio and video messages, as well. My student began to show which student did or did not respond, who responded to email, voice, or video. The key was to keep engaged and find the method that worked for each.

While teaching in-person classes, my grading system had been established but this new online version made me re-evaluate and change. My grading weights shifted from early in the semester, where the student was, perhaps, just learning terms and material to more weight later in the course where more applications and analysis were preferred. From four exams, the student could replace the lowest of the four exams with the score from the highest (Nilson, 2016).

While the courses of Principles of Macroeconomics and Principles of Microeconomics are not inspiring course titles, I decided to make a change by introducing a theme for each course, plus changing the look of the course on Blackboard to help motivate students in a small way. In Blackboard, I moved from the traditional black and white to that of colors, plus reorganized the menu to suit my class.

Instead of a student, when opening Blackboard, seeing a basic course title, they now see this much more colorful and hopefully engaging graphic:

Principles of Macroeconomics



Scaling Mt. Everest: In Search of Yeti

Typically, the first class includes presenting the course syllabus. However, will the student read the syllabus? Recently, the syllabus has grown exponentially as the university now requires a multitude of institutional offerings and descriptions which have seen the two-page syllabus grow to over 10+ pages. No wonder the students are not reading the syllabus. I decided to create an effective graphical syllabus for both courses, as an alternative, still leaving the traditional syllabus posted but adding the graphical syllabus. This syllabus is appealing and offers a concept map of the course (Nilson, 2007).

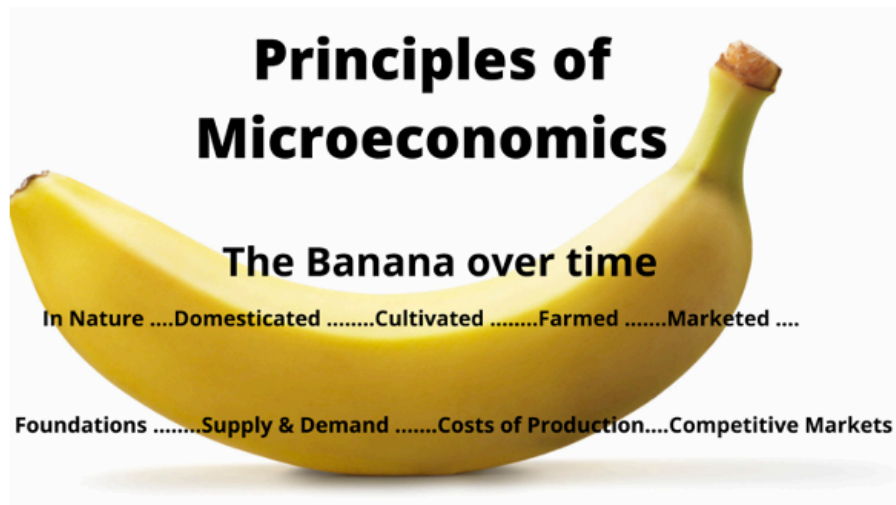
The graphical syllabus for Principles of Macroeconomics offered the challenge of climbing Mt. Everest, implying that upon learning the basics, one is preparing for both teamwork and the rigor of the climb to ascend the course and complete the climb of Mt. Everest.



For Principles of Microeconomics, the student's view upon entering Blackboard is this appealing and funny image:



The graphical concept syllabus depicts the banana over time, as in Micro we start with the basics, move into the factors of production, costs of production and structures of competition:



In Micro, while covering the core material, it was accomplished with the underlying theme of the banana yet also included the ongoing developments relating to all things COVID-19.

The COVID-19 experience, forcing us to online teaching, has encouraged me to reflect upon how to motivate students to a higher degree as well as emphasized the renewed importance of communications.

While this reflection article has focused upon the 2020 period during quarantine, as we are in 2021, I see a change in my current students. My students in the CCSU new HyFlex mode are anxious to return to an in-person class, thriving for a return to human interaction. Fall 2021 may see a growth in the quality and depth of education at CCSU.

As we approach the fall 2021 semester, I feel better prepared should there be such a reoccurrence of an event like COVID-19 again. We have all been through an extremely difficult and trying time. We have survived and are now both steeled and better prepared at home, at work and at the university.

Keeping engaged with the students during COVID was key. That engagement helped to keep the students connected, complete the course and for the university meant a higher degree of student retention.

This has been a challenge! We all have learned from it.

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All illustrations in this submission are by the author.

Mitch Charkiewicz, during the COVID quarantine period, earned the nationally recognized Certificate in Effective College Instruction through the Association of College and University Educators (ACUE). Mitch was honored at CCSU with the Excellence in Teaching Award in 2018.

LIFE AS A CHAIR DURING THE PANDEMIC

CHAD WILLIAMS

One thing that has become abundantly clear over this past 18 months is that while we have all lived through the same pandemic, everyone's experiences and challenges have been unique. I reflect here on what my life has been like as a department chair during the pandemic. Like many people, I was following the updates as COVID-19 spread and came closer and closer to home. However, the memory that sticks out the most to me is Wednesday, March 11th, the lecture before everything changed.

That morning we found out Saturday would be the last day in-person and all classes would move online for some period after Spring Break (the following week). That day I had an afternoon and evening class. In my afternoon class I tried to cover the material, but we all were distracted by the uncertainty of what was to come. Immediately after class, one of my faculty asked if they should cancel their evening section because they were afraid to go into their classroom. That semester I had been part of a faculty development learning group, Brave Teaching, focused on Brené Brown's ideas of being willing to be vulnerable to create a space for connection and resilience. For my evening class I realized that if there was ever a time to embrace that idea, it was now. When students came in, rather than finding me up at the white board, I was sitting on a desk at the front of the class and we just talked. I didn't have answers to most of their questions, but just as for them, this was going to be all new for me and we would need to help each other out. The next day campus closed.

Spring Break was anything but a break. Like me, many of my faculty had never taught online and we had just one week to figure out how to change our labs to activities that could be done from home, how team projects could be altered for remote collaboration, or if something had to be scrapped, brainstorm what could replace it. Lectures seemed like one of the easier aspects at the time; teaching to a live group of online students, sure it would be different, but it couldn't be that different, right? Perhaps I should have said, if you are really good at skateboarding, how much different could surfing be?

When the semester ended, I was thankful for the chance to catch my breath, but it was short-lived. In order to ensure the safety of department faculty and students as well as ensure students had a solution for not having access to on-campus labs (a critical aspect of a Computer Science degree), I served on the task force for reopening the University in the Fall. This was rewarding in that I had input regarding the safety of my department members and students; I could also advocate for what my department needed. It was also exhausting. We were trying to prepare a university for an unknown new world where the rules were constantly changing. Between taking classes on better online teaching to share with my department, leading a workshop for our own faculty on improving online teaching, and training faculty for HyFlex classrooms, it made for a full

summer of 60-hour weeks for a Chair's stipend, which works out to less than minimum wage. But when the summer was over, I knew my department was as ready as we could be in the face of the unknown to be successful for the coming academic year.

During the 2020-21 academic year I was able to see the hard work from the summer pay off. We had multiple faculty nominated by students for the Excellence in Teaching award despite this being the first time they had taught classes fully online. There were definitely hiccups that ranged from working with department faculty on technical challenges in their HyFlex classrooms, to me teaching a few classes from my child's school parking lot because there weren't buses and both my spouse and I work. But I also saw the things you simply cannot prepare for, such as the heart-breaking role of trying to help our students not lose their dreams of an education as they lost family members and jobs, and balance their own education while helping their child participate in remote school or caring for sick members of their own household. What I found most critical, though, was realizing that so many people involved—whether faculty or students—were having to redefine and figure out how to manage, cope, learn, and teach in the new “normal.” Being vulnerable with students and faculty and admitting you don't know the solution, but you are willing to work with them and are empathetic to the challenges, made a world of difference.

As I write this, I see a lot to look forward to in the coming year: teaching face-to-face, connecting in-person with students and colleagues, and resuming our Brave Teaching group. I have no doubts this coming year is going to bring its own set of challenges, but I know we can do it together.

Chad Williams, PhD, Associate Professor, Chair of Computer Science and Co-Coordinator of Cybersecurity, received his Masters from DePaul University and PhD from the University of Illinois at Chicago. He joined the CCSU faculty in 2011 and teaches undergraduate and graduate courses in computer science and cybersecurity. His current research focuses on data mining, intrusion detection systems and leveraging student creativity to enhance computer science education methods.