Computational Media at the Art/Design Core
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Hello. My name is Shawn Greenlee. I am Assistant Professor of Foundation Studies at the Rhode Island School of Design.

Today I am presenting on the curriculum that has been evolving in Foundation Studies around computational media, what we might also understand as digital media, new media, or emerging technology practices. This report is not a comprehensive statement on the full range of teaching and learning taking place in our Division, but rather it is on one, significant factor that has catalyzed a set of discourses I believe are positioned to have broad impact. My hope is that you will find some resonance with your own foundation programs or first-year curricula, and that my talk here today might be a valuable contribution to AICAD discussions around the foundation year, of which we've heard about some recent innovations at this conference.

Beyond the first undergraduate year, I think we can certainly bridge to computational media at all levels, and what I believe is one of the cores for art and design education today: a substantial experience with the composition of systems through computer programming and electronics.

I'd like to acknowledge RISD's Academic Commons Program and the research support I've received from it, towards developing school-wide curriculum recommendations. I'd also like to thank my colleagues at RISD for dialogues that have informed my outlook on this matter.

To start, I'll offer some remarks from Nisan and Schocken's 2005 Computer Science textbook, *The Elements of Computing Systems,*

> "Once upon a time, every computer specialist had a gestalt understanding of how computers worked. The overall interactions among hardware, software, compilers, and the operating system were simple and transparent enough to produce a coherent picture of the computer's operations. As modern computer technologies have become increasingly complex, this clarity is all but lost: the most fundamental ideas and techniques in computer science – the very essence of the field – are now hidden under many layers of obscure interfaces and proprietary implementations…
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> … many computer science students are missing the forest for the trees. The typical student is marshaled through a series of courses in programming, theory, and engineering, without pausing to appreciate the beauty of the picture at large. And that picture at large is such that hardware and software systems are tightly interrelated through a hidden web of abstractions, interfaces, and contract-based implementations. Failure to see this intricate enterprise in the flesh leaves many students and professionals with an uneasy feeling that, well, they don't fully understand what's going on inside computers."

While I do not mean to suggest there is parity between the fields of Computer Science and Art and Design, we should recognize something in common here. We take our systems for granted. It is difficult to grasp the regulations on expression and discovery that accompany our digitally mediated experience. Certainly at times, this regulation enhances our lives. No doubt, we appreciate closed systems such as the user interface of most mobile phones. We appreciate a better user experience. But if we do not develop a platform for our students to critically engage in a sophisticated way with computer-mediation, then they will remain subservient "users," guaranteed impedance, to remain unaware of the imposed controls, or how to go about circumventing them.

Not only is this a problem for the artist or designer but also our citizenry in general. One only has to reflect for a moment on the steady stream of electronic privacy violations by our government, corporations, social media platforms, and other institutions, sometimes permitted through "cloudy" terms of service agreements and sometimes not.

Over the past seven years or so, a handful of faculty members in our Division have been introducing computer programming as an artistic medium. As one strategy for incorporating new or digital media processes, this initiative positions students as ***creative programmers*** more than ***software users***. Introducing students to programming in the context of Foundation studio classes enables investigations that intersect various conceptual frameworks, notions of embodiment, and forms of labor. Labor forms I would categorize as:

1) the manual (with hand)
2) the mechanized (with machine)
3) the automated (with algorithm)
   and
4) the cognitive

The qualifiers of "individual" and "collective" (in order to provide another platform from which to explore these boundaries) may further distinguish these labor forms.

It is my position that learning to program enables better literacy and fluency with computational media as a whole. Further, it promotes the understanding of and critical engagement with modern culture, providing a new perspective from which to critique software and its regulation of expression: sometimes to benefit, sometimes to impede. Learning to program is transformative for many students, promoting mental acuity and agile extemporization. Through programming, students acquire a new sense of freedom and develop informed perspectives on critical theory and contemporary production methods in Art and Design.

I hold that incorporating computer programming into the Foundation year is critical to a contemporary discourse; and is most appropriate to be introduced in the context of that first year. At RISD, we've seen increasing student demand at all levels for access to an extensive curriculum that emphasizes programming. We should not wait until students have declared majors or concentrations to fire up their inquiry.

At many art and design schools, the interest in computational media has only grown, and in fact it touches nearly every discipline in some capacity. With origins traceable to the 1950s, the use of computers in art making is <u>not</u> exceptionally new. From an art historical standpoint, we can locate some significant shifts to 1968 with the *Cybernetic Serendipity* exhibition at London's ICA curated by Jasia Reichardt and to the 1970 *Software* exhibition at New York's Jewish Museum

curated by Jack Burnham. And certainly we could list many points of reference from the past forty years.

Developments in the past decade have changed mindsets and made computational processes in the context of the Foundation year more desirable at RISD. From the standpoint of "making" (whether this is the making of tangible objects or the making of systems), these developments include the emergence of new programming languages, microcontroller platforms, display technologies, and digital fabrication equipment. Of equal importance is the influence of computation on contemporary culture and society in general. The composition of dynamic, generative, and interactive systems is a crosscutting concern (not only in art and design). These practices exist beyond the utilization of the computer as an aid or tool for making physical objects, and focus our attention on behaviors, processes, and experiences. Terminology such as electronic media, art & technology, and new media have been and continue to serve as organizing categories for artists, designers, historians, and theorists concerned with events in the later half of the 20th century and the early 21st. These shifts will continue to be influential for new faculty and are highly relevant to our present students, most who were born during the 1990s dot-com boom.

Backing up for a moment, a small bit of context on the Foundation year at RISD. About a year or so before my hire into the Division in 2010, two of our program areas changed their names. 3-D Design became Spatial Dynamics and 2-D Design became Design. Drawing remained Drawing. This change was made to recognize that Foundation had evolved. I will note that we did not created a separate 4-D or digital media style course then or earlier. Our collective understanding on this is that presently it makes little sense to separate out digital or time-based processes from existing course areas. This is because we have already seen a progression where long-standing faculty members have incorporated such practices; and with new incoming faculty these methods are key to their work and there is no incongruence with the program areas we've already established. I'd like to underscore that our course areas are not tool, medium, or practice specific, and this has allowed faculty to teach from their depth and breadth of experience, investigations, and discoveries.

Each of the three programs of study meets one full day per week. Freshmen are assigned to a section of approximately 21 students who attend the three, highly immersive studio classes together. In the spring semester, the students repeat these three study areas with a different set of faculty and with a new cohort of peers. Learning from two different professors in each program area creates a rich environment where students challenge assumptions, navigate generative contradictions, and thrive within a broadly interdisciplinary framework. By design, students have very different experiences between their two Drawing, two Design, and two Spatial Dynamics faculty.

In considering the history of the Foundation year at RISD, we can see that its establishment in the 1930s coincided with the school shifting from orienting itself around training for local industry, to more clearly building its reputation as a higher education institution with the granting of degrees. Through the establishment of Foundation, essential factors for art and design education were recognized. Students needed a time and place to self-discover, to form subjectivity by digging into several things deeply, especially before deciding on a specialization area.

Across the history of foundation programs at large, I think we can recognize that handcraft has been elevated as a measure of authenticity alongside formal concerns centered on observations of nature (broadly defined). Many foundation programs will identify a set of traditions derived from the Academy, Bauhaus, and early Modernism, though certainly not confined to these. Individual,

manual labor is emphasized with a certain distancing from mechanized, automated, and collective forms. What is at stake in such a move, and especially profound over decades, is the raising of boundaries that place a limit on inquiry and knowledge acquisition, and the closing off from substantive mediums and discourses, including what Jack Burnham would describe in his 1968 book, *Beyond Modern Sculpture*, as the movement from an object-oriented to systems-oriented culture, a shift from making "things" to making the "way things are done." When habitual skepticism accompanies the introduction of any technology that is not a hand tool or any medium that does not permit handcraft, we should clearly understand that old boundaries have been illuminated. By no means should this analysis be taken as a stance against handcraft or time-honored methods. Rather, I am aiming to quickly provide a perspective from which to understand how uneasy relationships to new tools, mediums, practices, and technologies have come about.

To date, computer programming has mostly been located in our Design course area, with recent interest following in the other two: Spatial Dynamics and Drawing. Presently, we are assessing what has worked in the past, as we develop some new approaches for faculty that are teaching programming fundamentals in their studios. Systems or algorithmic thinking is happening across the Division (and not only through computer programming).

In the time I have left, I'd like to give you a sampling of some of the platforms we are using to explore computational media in the foundation year.

In terms of programming, I have students work both individually and collectively to create their own digital image-making systems requiring real-time interaction with devices connected through the OSC communications protocol, as well as with microphone, keyboard, and mouse input. They have been creating algorithms for generative design, where variations within input data streams produce great variety in output.

There are two paradigms important to this discourse: data flow programming and text-based coding. As for the first, within a data flow or visual programming environment, one connects boxes, each representing a small bit of code in order to construct an algorithmic system. Examples include long-standing applications like MaxMSP (cycling74.com) and Pure Data (puredata.info), and newer environments such as NodeBox, produced by the Experimental Media Research Group in Antwerp (nodebox.net).

The second is text-based coding. There are several examples in this domain. Perhaps the most popular with visual artists and designers today is the Processing programming language (processing.org), which is also a suitable introduction to Java. After some adjustment to the syntax, first-year students are able to pick this up very quickly. In terms of programming microcontrollers, we have Arduino (arduino.cc). On the audio programming side, languages like SuperCollider (supercollider.sourceforge.net) and ChucK (chuck.cs.princeton.edu) provide exciting directions.

As for the category of display technologies, one of the ways in which I have students explore temporal and spatial dynamics is through non-visual means in the medium of sound. In one unit, I have students work with our 8-channel sound system in order to explore spatial audio composition. Not only do they get the opportunity to organize sound in time, but also in space. As an auditory display technology, this sound system allows students to explore the sensation and perception of virtual space by creating sonic environments and events. Students spend a few weeks recording sound in the field and exploring the acoustic properties of everyday objects before they compose a piece inspired by the techniques of Musique Concrete and Acousmatic

traditions. On the computational side, students presently use standard digital audio applications in combination with data flow environments (MaxMSP). Where a systems approach is clear is in considering the multi-channel aspect of the display and the ephemeral nature of the sonic components, which will interact in actual, physical space creating sensations of movement and place for the listener.

In the area of digital fabrication, this year we've been able to acquire a laser cutter. With digital fabrication technologies becoming more accessible in recent years, we have been determined to explore this territory. Digital fabrication equipment alongside microcontroller platforms, which lend themselves to sensing and robotics-oriented work, have become important ways to explore inputs and outputs of computational processes that are not screen-based, and to engage the tangible and tactile. This enables students to really mix the labor forms I specified at the beginning of my presentation, so that they can move freely, back and forth, between thinking in terms of the hand, the machine, and the algorithm... all of which I view as important to our foundational discourse at RISD.

Thank you.