

Open and Integrative

*Designing Liberal Education
for the New Digital Ecosystem*



BY RANDY BASS AND BRET EYNON



Association
of American
Colleges and
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*Association
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Foreword

Digital educational innovations have recently been the focus of much charged rhetoric—from declarations that technological disruption will enable everyone to attain a college degree quickly and cheaply, on the one hand, to fears that such disruption will eliminate the need for faculty and put the majority of colleges and universities out of business, on the other. Thus far, the dialogue has largely been centered on the technologies themselves, their capabilities as well as the threats they may pose.

In *Open and Integrative: Designing Liberal Education for the New Digital Ecosystem*, Randy Bass and Bret Eynon reject this starting point, choosing instead to make “a robust twenty-first-century vision of liberal learning” the lens that focuses a vision of higher education in a digital world. While cautioning us against the impulse to assume that technology alone can solve the problems of higher education cost or access, they argue that we can only achieve a quality liberal education for all students by thoroughly integrating learner-centered and equity-minded digital technology into what we do. Student learning, student agency, and inclusive excellence must be the primary drivers for how and why digital innovations are integrated into higher education.

Open and Integrative was written in the context of AAC&U’s General Education Maps and Markers (GEMs) project, funded in part by the Bill & Melinda Gates Foundation. A project devoted to a transformative redesign of the nation’s largest educational program could hardly ignore the ways in which liberal education needs to be integrated with the emerging digital environment, in ways that best serve student learning. This report is one product of the initial planning phase of the GEMs initiative, supplementing publications focused on general education as a whole, the frameworks needed for equity and inclusive excellence, and assessment.

Bass and Eynon frame the digital revolution in higher education as an inspiring design opportunity, asking, “What forms of liberal education are only possible now?” What might we imagine, if we were newly designing liberal education—for all students, in all majors and all types of institutions—in the context of the digital ecosystem?

Bass and Eynon use the term “digital ecosystem” to refer to the whole constellation of learning technologies—institutional and noninstitutional—that characterizes our contemporary life. Colleges and universities do not hold a monopoly on knowledge production and dissemination; they exist within an expansive environment of information and analytics. As the authors note, this reality requires higher education professionals to “separate the core practices of institutions that are most germane to their value propositions from the habitual structures that can be reshaped by opportunities offered by the new learning ecosystem.” Within the digital learning ecosystem, higher education is ideally a site focused around *engagement, community and mentorship*, and *integration*, in which the disparate and “unbundled” learning opportunities endemic to our constantly networked modern life can be “rebundled” to support an integrative vision of learning.

Student learning, student agency, and inclusive excellence must be the primary drivers for how and why digital innovations are integrated into higher education.

The current tendency to focus on platforms and profits rather than to design for engaged and integrative learning threatens to reinforce existing inequities in higher education, via a two-tiered system of unbundled (not to mention lonely and decontextualized) education for those without the means to pay for the guided, community-rich education that is in danger of becoming even more the purview of the privileged. When a new majority of diverse students is enrolling in college, allowing the digital revolution to perpetuate and further contribute to inequity in higher education is particularly unconscionable. Some of the arguments for unbundled options claim to stem from equity concerns (cost and access), but in fact studies show that systematically underserved students fare worse in unstructured, do-it-yourself learning environments, and they succeed in environments with strong advising, mentorship, and clear pathways to their goals—all of which require continued guidance from faculty and staff.

Bass and Eynon argue for a renewed commitment to ongoing professional development that can help faculty and staff learn not just about new technologies, but about pedagogies that take advantage of new understandings of learning that are made possible through those technologies. To fully exploit the potential of adaptive software, predictive analytics, e-portfolios, and other developments to improve student learning and agency, faculty and staff will need not to have their roles disaggregated, but instead to collaborate more fully. We need the digital environment to enable cohesive learning that is mediated by human judgment and connection.

Through understanding and negotiating the tensions and relationships between integrative and disintegrative forms of learning, between the explosion of unbundled information and the bonds of learning communities, we have a tremendous opportunity to re-center higher education on student agency and mentored guidance through inquiry-based learning and problem solving. The digital learning ecosystem can support this learner-centered focus by encouraging the shift of higher education resources away from routine tasks and simple knowledge transfer, and toward work on complex and unscripted problems, reflection and identity development, mentoring and community at scale, and integrative learning of all kinds. This is a move for which AAC&U has been arguing for decades, and that is crystallized in our LEAP Challenge to require Signature Work of every student.

Open and Integrative reminds us that a commitment to the core purposes of liberal education, and to our best understanding of student and organizational learning, must be our guide as higher education navigates the unpredictable digital environment.

Carol Geary Schneider
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CHAPTER 1

The Digital Challenge: From Disruption to Design

What are the implications of the digital revolution for higher education? It is impossible to miss the ways that wave after wave of digitally driven change keeps crashing over us, altering our economic, political, cultural, and educational shorelines. The complex digital environment growing all around us is reshaping the ways we learn and communicate in our everyday lives.

The emergent digital environment is characterized by information abundance and networks of networks; it is socially intensive, encompassing online communities of all scales. It is an environment where data and algorithms control search and retrieval processes. These processes are rewriting the rules for how we seek and receive information, with the outputs of that information increasingly personalized to our interests and profiles, but whose operations are often opaque and out of our control. Moreover, the convergence of all these factors has created a new digital learning *ecosystem* that is complex and interconnected, with properties of emergence that make possible almost limitless variation.

While this digital ecosystem is profoundly changing how we access information and share knowledge, it is arguable that it has had less of an impact on the core practices of *formal education* than just about any other sector in our society. Yet, the potential for transforming higher education is immense. We can't now fully know where this is heading; but we do know that any discussion of the digital opportunity to reinvent higher education that *begins* with technology is doomed to a diminished vision of learning.

Therefore, to ask the question about the role of digital resources in transforming higher education is *not* to ask first about tools, platforms, or particular resources. It is not to ask how digital technologies can merely broaden access to content, self-paced assessments, granular competency-based modules, or analytics-driven “recommendation engines.” Nor is it about asking simply how we can scale *current* educational structures and models into either massive educational contexts or automated environments with a diminished need and role for faculty.

We believe that the question needs to begin with reimagining the core purposes of liberal education in this new context: *What is the role of the digital ecosystem in making a quality liberal education available to all, equitably?*

The urgency of this question is both heightened and complicated by a host of issues, including those of funding, cost, accountability, and, most pressing, issues of equity—specifically, the emergence of so-called “new majority” students. In recent decades, the arrival of massive numbers of new students has changed the face of American higher education. US colleges now serve a student body that is more diverse than ever before on indexes ranging from race and ethnicity to immigration status, native language, age, sexual orientation, and religion. It is widely agreed that these students are crucial to America's future—economically, socially, and



What is the role of the digital ecosystem in making a quality liberal education available to all, equitably?

politically. We need these students as central members of an educated workforce and engaged citizenry, so vital to addressing challenges from economic innovation to climate change.

This way of approaching the digital opportunity provides a new path for addressing the fundamental tension between integrative and disintegrative versions of learning.

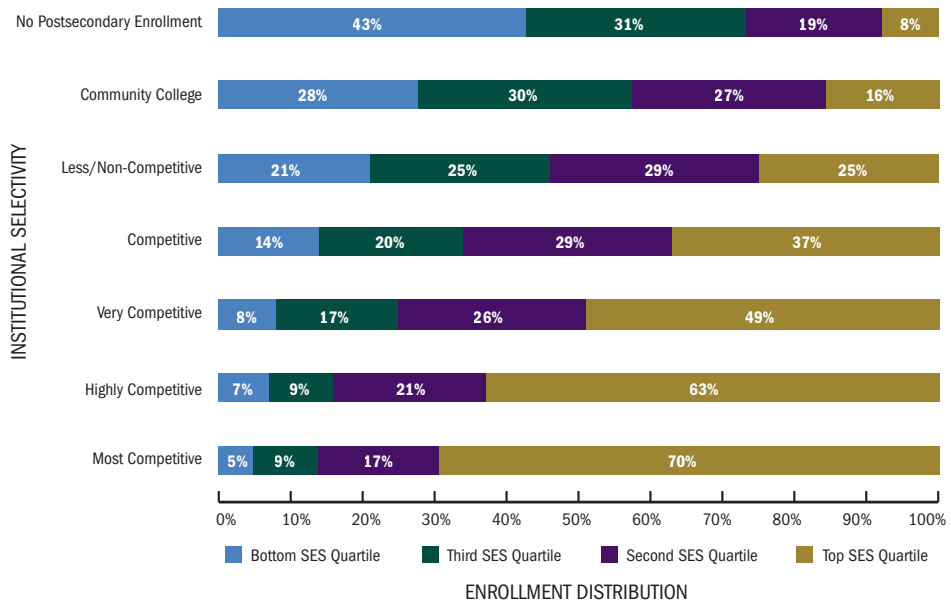
Yet, although they have exciting potential, energy, experience, and cultural capital, these new students arrive on American campuses with wildly uneven academic preparation. Often coming from ravaged and dysfunctional school systems, for example, many first-generation college-goers have limited understanding of college life and of the habits and dispositions needed for college success.

These new students need the benefits of liberal education—critical thinking, problem solving, historical perspective, integrative learning. They must have these skills to survive and thrive in challenging circumstances and so they can contribute to, and provide leadership to, their communities and our society as a whole. It is in this context, along with the rising concerns about affordability and accountability, that we must consider the digital revolution and the opportunities it offers to not only extend but also revitalize and fundamentally rethink liberal education.

The nexus among the emerging digital ecosystem, the reimagining of the core purposes of liberal education, and the broadened access to higher education shapes the opportunity for transformative redesign. Realizing this opportunity requires a shift in thinking that holistically reframes many of the familiar elements of the current discussion around disruption, such as personalization of education,

Socioeconomic Stratification in Higher Education

Students from low income backgrounds are concentrated in the least resourced segments of higher education, particularly community colleges, which now serve nearly half of all currently enrolled college students.



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online learning, outcomes, analytics, and assessment. It demands a vision that goes beyond a narrow focus on how digital tools can enhance the ways our institutions currently operate. Instead, we must acknowledge the fundamental changes associated with the digital and connected age; leverage the emerging capacities of networks, data-informed human judgment, and scalable communities; and invent new ways to realize the core learning values at the heart of our institutions.

Perhaps most important, this way of approaching the digital opportunity provides a new path for addressing the fundamental tension between integrative and disintegrative versions of learning. The most influential commercial applications of educational technology have largely been disintegrative—i.e., modular, focusing mainly on efficiency and productivity, and addressing narrow dimensions of learning. Often implemented in institutional contexts that overemphasize technology as the solution to educational needs, technology investments have targeted the dimensions of education most susceptible to commoditization and scaling. We do not reject these disintegrative elements—quite the opposite—but we will argue here that the future of higher learning is best served when they are used in the service of an integrative vision that emphasizes connections and the cohesive design of learning experiences aimed at developing the whole person.

This kind of integrative vision of learning as the goal for education's digital future serves to elevate the conversation, moving beyond the use of digital tools merely to advance current practices in order to consider how education might be reshaped in the same ways that digital information and globally networked resources have already fundamentally changed our culture. Consider the following design challenges:

- *What could liberal education look like if we were inventing it at this moment in history? What forms of liberal education are only possible now?*
- *How might the new digital context—the whole of the emerging learning ecosystem—help us renew a vision of liberal learning and make it widely available to, and meaningful for, an expanded population of college students?*

Such design challenges flip the discourse of disruption. In a discourse shaped by fears of disruption, the focus within institutions is often on “how might we stay who we are *despite* what is happening to us and around us?” In contrast, to pose a *design* question is to ask, “Who do we want to become? What kinds of institutions should we be in the future? What kinds of graduates should we be producing?” It is only by referencing these broader questions, early and often, that we can ask what it might mean to redesign liberal education for the new digital ecosystem.

From Unbundling to Rebundling

To put this more bluntly: applying digital solutions to educational challenges, without structural changes, will not lead to transformational learning; however, it may well lead to a diminished version of higher education, especially for the vast majority of students who are not in privileged educational environments. While we are interested in ways of leveraging digital tools and resources to enhance the kinds of learning that we value most, we are far more interested in ways the emerging digital environment could change the relationship between the whole of an education and its various component parts.

Indeed, that is what is at stake in the “unbundling” argument—the idea, as EdX CEO Anant Aggarwal puts it, that the whole of education can be unbundled in “time, function and content.”¹ Unbundling is a hot topic, with propositions offered by a wide range of analysts and entrepreneurs. Our interest is neither in championing nor critiquing these approaches but to ask, if we assume the increased unbundling of time, function, and content—both inside and outside legacy institutions—then what will hold the pieces together? By what design principles and with what models do we integrate the best of what is unfolding in the larger ecosystem and the best of what we know about the long-developed value of higher education and liberal education?

The argument for “unbundling” higher education begins with the observation that colleges and universities are complex, multipurpose institutions that play different roles (knowledge transfer, skills development, coming-of-age communities, etc.) and operate, as Clayton Christensen famously posited, according to multiple different business models at once. This complexity is then “vertically integrated” in such a way that it both drives up costs and, at least in elite institutions, offers students a wider array of “services” than any one of them needs. “A college degree,” say Ryan Craig and Allison Williams, “signals not one thing but, rather, a bundle of many

DESIGNING LIBERAL EDUCATION: A NOTE ABOUT SCOPE

Most works on big topics claim a very ambitious space in their titles and theses. Ours is no different. Yet in this essay we recognize that we are only addressing some of the many dimensions implied by our subtitle, “designing liberal education for the new digital ecosystem.” The full scope of the topic is broad and complex. What new frameworks are needed to rethink the role of liberal education over the coming decades, for citizenship and intercultural dialogue, environmental challenges, and questions about our intrinsic humanity in an increasingly technological world—to name just a few topics? What kinds of knowledge, skills, and dispositions—critical and creative capacities—will the next generation need to have in order to deal with the most complex global challenges? What are the legacies of culture and history that are essential to inform those capacities? Many of these topics are addressed throughout AAC&U’s body of work represented by its publications and conferences; they are also covered well and deeply by leading scholars and writers, much of whose work is also represented and referenced in AAC&U publications.

Our focus here is on one significant dimension of this challenging set of questions: How might the new digital ecosystem—which is redefining how we access and share knowledge, shape and share our identities, create and nurture communities of practice—reshape our educational practices, especially as they involve the adoption of digital tools and platforms into our classrooms and institutions? As big as these questions are themselves, we know they will, in the end, only have meaning when they are integrated with questions of academic substance and larger purposes as they are expressed throughout the curriculum.

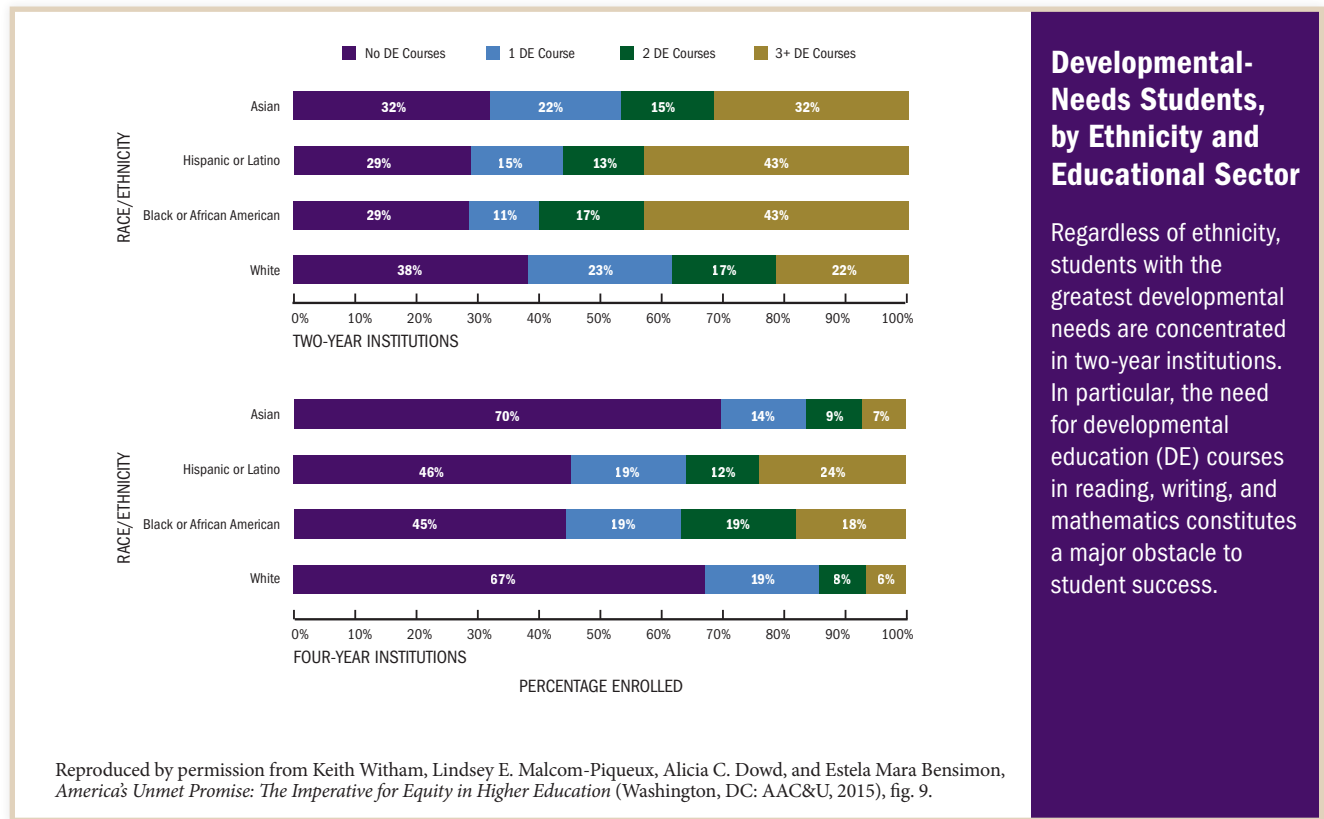
In acknowledging the scope and limits of this essay, we also want to assert that this work itself is meant to be “open and integrative”: *integrative*, in that it draws together many diverse threads and perspectives, a few decades in development; and *open*, in that it is meant to initiate and support conversation and action within the higher education community. The core elements and design principles could be stated in many ways; the examples could be amplified by many others, and will in a short period of time be replaced by others. Our hope is that this essay helps open the conversation and invite not only dialogue, but also a growing number of precedents and a building body of evidence to help shape an alternative future.

things... As a result, when students pay for a degree, they are also buying products and services related to real estate, dining, sports, and research.”² “The complexity of the bundle,” as Jose Ferreira, CEO of Knewton, frames it, “reduces the product’s transparency, impeding consumers’ ability to do cost-benefit analysis.”³

All of this makes higher education, as the argument goes, ripe for unbundling. New entrepreneurial providers want to get in on the action offering “a la carte” services that they contend will better serve students and drive prices down. This has already begun in the arena of courses, where “the real unbundling opportunities surround the content and delivery functions of a university ... quickly remaking the idea that a college education must be delivered at one physical location by professors who create and curate their own courses.”⁴ Others speculate that the unbundling can go beyond content to various services such as “assessment” (testing, prior learning) and support services, such as advising, supplemental instruction, career mentoring. Echoing proposals for “saving” Social Security, some have argued for a new model that would create “human capital savings accounts” where “students could access their student aid dollars in a savings account and use those dollars to purchase education from any provider who is eligible.... They could spend remaining funds on approved providers of unbundled products like tutoring, student services, mentoring, and so on.”⁵ In this way, students would only buy the services they need.

“There will always be a market for the elite bundled college experience,” predicts Ferreira. “But new unbundled or partially bundled alternatives will emerge, and eventually they will dominate the industry.”⁶

If we assume the increased unbundling of time, function, and content—both inside and outside legacy institutions—then what will hold the pieces together?



Developmental-Needs Students, by Ethnicity and Educational Sector

Regardless of ethnicity, students with the greatest developmental needs are concentrated in two-year institutions. In particular, the need for developmental education (DE) courses in reading, writing, and mathematics constitutes a major obstacle to student success.

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Arguments for unbundling rest on two sets of assumptions that give cause for grave concern. The first concern has to do with assumptions about the nature of learning. In his provocative piece on the “National College Degree,” Paul LeBlanc concludes, “So much of our discussion and debates over higher education center on curriculums, content and skills—the heart of what education offers, many would argue. But those are increasingly free, easy to replicate and scalable. The messy, expensive and complicated parts of education are the human dimensions.”⁷ Michael Staton carefully distinguishes among content acquisition, mentored learning (“meta-content and skills”), and personal transformation, in his analysis of the “packaged bundle.” He asserts that the “content acquisition” components are elements that are “easily replaced, easily embraced” by new providers outside institutional structures and, conversely, legacy institutions should focus on those dimensions that cannot be easily replaced, such as “meta-content” and “personal transformation.”⁸



A growing body of scholarship demonstrates that new majority students are more likely to thrive in “bundled” environments characterized by community engagement and cohesive advisement and other support services.

But can the acquisition of content, knowledge, and skills be so easily parsed from higher-order performance and integrative understanding? A newly validated value proposition of a more integrative approach to education confirms that learning takes place quite richly and effectively in contexts we might call “integrative”: contexts where content is engaged through practice, where knowledge is developed in diverse communities, with mentors and role models of many kinds. A new and burgeoning body of research argues for the efficacy of the kinds of learning that have characterized place-based institutional learning.⁹ This is not to say that we should, therefore, reject the opportunities afforded by online and modular learning or that we should dismiss the possibilities of unbundling in terms of time, function, or content. But it does suggest that we need very carefully to examine the assumptions driving such strategies in order to ensure that they do not belie what we know about effective and durable learning.

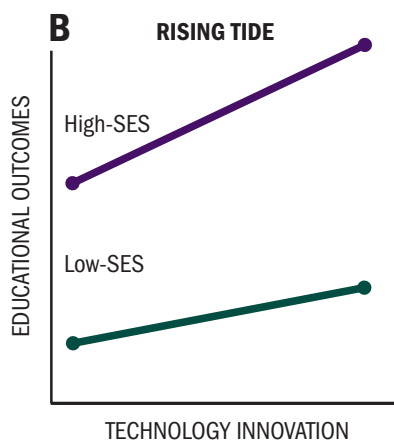
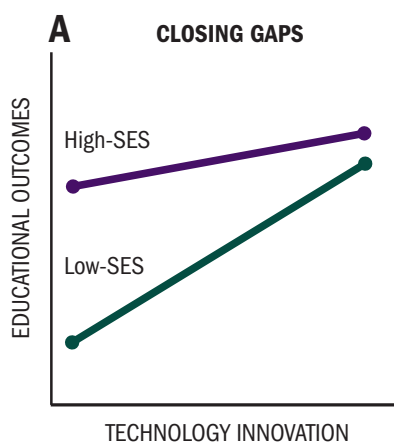
Our second concern is about equity and assumptions being made regarding the ways that new majority students would be willing to access and pay for supporting services. These visions of an “unbundled” education system, where students take whatever courses they want from multiple online sources, tend to ignore the accumulating data that suggests that massive online courses work best for already-accomplished learners, most of them older or more affluent.¹⁰ In contrast, a growing body of scholarship demonstrates that new majority students are more likely to thrive in “bundled” environments, such as the ASAP program at City University of New York, which is characterized by community engagement and cohesive advisement and other support services. The blithe idea, a la Ferreira and others, that such support services would “always” be available to all at elite colleges, but available to less-resourced new majority students only for purchase, perhaps from profit-driven agencies, raises troubling possibilities. It could easily, we fear, deepen the already unacceptable stratification of higher education. Reinforcing a counter-productive, separate, and unequal caste system, it could place new, unjustifiable obstacles in the path of those low-income, minority, first-generation college students who most need support, leading ultimately to increasingly dysfunctional economic inequity and tragic social injustice.

Is it possible to reimagine how those aspects of education that appear to be “easily replaced, easily embraced” by unbundled opportunities fit into larger goals and purposes? The central challenge of our time is to separate the core practices of institutions that are most germane to their value propositions from the habitual structures that can be reshaped by the opportunities offered by the new learning ecosystem.

The potential for improvement and transformation lies in the creation of institutions that are more highly integrated and that are well positioned to take advantage of new ways to “unbundle” and “reconnect” at the same time. By acknowledging and taking advantage of the newly porous boundaries that separate the “inside” from the “outside” of the institution, such a reform could maximize the distinctive value of institutions as learning communities. The call for redesigning liberal education for the new learning ecosystem challenges legacy institutions to rethink the totality of their educational enterprise in ways that are at once agile, open, and integrative.

Who Benefits Most from MOOCs?

In a 2015 study published in *Science*, examining the relationship between success in massive open online courses (MOOCs) and socioeconomic status (SES), John Hansen and Justin Reich used these two graphs to model contrasting potential conclusions. If the data resembled Model A, broad implementation of MOOCs tended to help disadvantaged students close the educational outcomes gap. If it resembled Model B, the implementation of MOOCs would benefit more affluent students. The study found that the data resembled Model B, indicating that MOOCs tended to widen the achievement gap between affluent and disadvantaged students. “Freely available learning technologies can offer broad social benefits,” they concluded, “but educators and policy-makers should not assume that the underserved or disadvantaged will be the chief beneficiaries. Closing gaps with digital learning resources requires targeting innovation toward the students most in need of additional support and opportunity.”¹¹



From John D. Hansen and Justin Reich, “Democratizing Education? Examining Access and Usage Patterns in Massive Open Online Courses,” *Science* 350, no. 6265 (2015): fig. 3. Reprinted with permission from the American Association for the Advancement of Science.

Reframing Core Elements

We suggest that the place to start exploring the digital opportunity for liberal education is with the core purposes or elements of liberal education as they are being reshaped in our current digital and connected learning context. The three core elements we focus on are these:

- **engagement** that builds from interest to purpose, knowledge, and capacity for lifelong learning
- **community and mentorship** that shape the ability to have an impact in the world
- **integration** that develops the capacity for dealing with complexity and change

These three elements emerge from the broad and enduring purposes of higher education—namely, to educate and develop individuals with skills and knowledge and to do so in ways that do not merely deepen, as Don Harward puts it, “by moving deeper within oneself but outwards in relation to others.”¹² They combine to support the core purposes of a “liberal education”: the development of the full self; the relation of self to others and to knowledge; and, ultimately, the capacity to integrate and make connections—across domains, between theory and practice, and over time.

The three core elements may seem retrograde or irrelevant in an era of disruption and unbundling. Yet, because of their fundamental nature, they can serve as a touchstone for a transformational vision of higher education. Because of their fundamental nature, they serve as a powerful point of departure for the next phase of higher education as we take up the following design question: *How might the new digital context—the whole of the emerging learning ecosystem—help us renew a vision of liberal learning and make it widely available to, and meaningful for, an expanded population of college students?*

For the most part these three core elements—engagement, community and mentorship, integration—have been coded into traditional liberal education institutions, often on a residential model. In only the best of circumstances, and too often haphazardly, have they had presence and impact in our public institutions as well. As we will discuss in detail below, they can now serve as key organizing elements in any consideration of the digital opportunity.

Although each of these core elements has roots deep in the history and tradition of liberal education, they are still evolving and changing. In many ways the new digital ecosystem is reinventing engagement in learning, and it can guide us in seeing how to deploy tools and practices to help us achieve *engagement at scale*. New social learning environments have helped change the shape of making and sharing knowledge, and can likewise enable us to bring *community and mentorship* into the heart of the academic enterprise. The web functions intrinsically by connections, and we can, in turn, use digital environments to make our curricular pathways far more *integrated*, intentional, pervasive, and, ultimately, sustainable as powerful sites for higher learning.

A Vision Worth Designing Toward

Utopian visions of the digital opportunity have cycled through higher education for decades. The MOOC- and web-driven narratives are only the latest versions of an argument that has perennial appeal: if only we could adopt this or that technology, then high-level educational opportunities would be available to everyone, everywhere, anytime. Such visions have dominated the technology narrative in higher education for the past twenty years and have driven the adoption of “technology-first” solutions. Our “learning-first” vision, alternatively, attends to all of these possibilities, but it embeds the core purposes of learning in the complex systems of our institutions and situates our institutions in the emerging ecosystem. Consequently, according to our vision, higher education in the digital age should be learner-centered, networked, integrative, and adaptive.

Learner-centered. Educational practices supported by digital tools in our institutions should, first and foremost, be learner-centered. By this we mean that digital environments are shaped around the engagement and empowerment of students as learners and agents of change, members of communities that create and apply knowledge. Students, particularly new majority students, need human connection with faculty, mentors, and other students. Institutions should privilege the use of technology to help a broad range of students build community, develop digital fluency, create and share knowledge, and take greater control of their own digital presence.

Networked. Higher education institutions exist within a broader network of learning, and institutional boundaries should be made constructively permeable. This requires institutional designs that capitalize on learning that takes place outside the classroom, through association with other institutions, within a global community, and on the web. These designs will, of course, vary greatly, as different kinds of institutions—from community colleges to research-intensive universities—have different missions, populations, and resource bases. Nonetheless, the key to the long-term sustainability of any college or university is to leverage the synergies inside the institution with the exponential growth of external resources, tools, and providers.

Integrative. When students come to an institution of higher learning, they should enter an intentionally integrative environment where digital pedagogies, tools, and practices help them connect a range of high-impact learning experiences: curricular and cocurricular, cognitive and formational, on-campus and online. The complex and iterative processes necessary for developing depth, complex thinking, and the dispositions associated with higher learning can be supported both singly and as a whole. Digital tools must help students see their choices, engage the experiences of others (past and present), reflect on implications and purpose, and make visible connections across multiple boundaries.

Adaptive. To serve an increasingly broad range of students equitably in a digitally enhanced learning environment, institutions must be transformed into more adaptive learning organizations. Faculty, advisement professionals, instructional technologists, and other staff play critical roles in developing new designs to promote deep learning for all students. Yet faculty and staff can only support students in this kind of learning when the institution has put in place

collaborative development and assessment structures that make the best use of available digital tools. If the ethos of inquiry is applied to institutional policy and practice, digital systems themselves can offer new ways to examine the evidence of student learning and inform decisions that will shape success for our students and our institutions.

Achieving this learner-centered, networked, integrative, and adaptive vision of higher education in the digital age will require an open-systems approach that simultaneously optimizes the coherence of institutions (as systems) and productively exploits the increasingly porous nature of the boundaries between an institution and various other elements of the external learning ecosystem. Such an approach brings two typically distinct discourses (the integrative and the techno-social) closer together and conveys specific messages to different stakeholders. Ultimately, the message for stakeholders *inside* higher education would be that a twenty-first-century vision of liberal education and inclusive excellence can only be achieved with the thorough integration of digital technology. This integration requires the recognition that the nature of learning, teaching, and the role of universities in the newly broadened learning environment has changed substantially. The message for stakeholders *outside* of higher education is this: implementing technology as a tool for educational productivity will not get us an education in sync with present and future needs. Digital learning environments will only facilitate the education we need if they are shaped by a robust twenty-first-century vision of liberal learning.

To enable this new synthesis, it will be necessary to reconsider certain assumptions about how we deliver curricular pathways and the educational experiences within them. That is, we cannot merely go about doing what we have always done, but at scale and with intelligent automation. Merely employing adaptive systems that give students immediate and targeted feedback, for example, will

RECLAIMING “SCALE” FROM “MASSIVE”

One of the consequences of MOOCs emerging on the educational scene was the appropriation of the concept of “scale” as the equivalent of “massive.” The promise of very large enrollments, large-scale broadcast pedagogies, automated and analytics-driven tools, and peer assessment came to dominate a vision of what scaled education, or learning at scale, could look like. Yet, prior to the MOOC moment, “scale” meant something rather different. It meant merely “larger than small or boutique” implementation. It meant “widely used” and “widely adopted locally.” And it could mean “scaling up” to include large-enrollment courses, which could be anywhere from a hundred to a thousand or more. In this essay, we want to reclaim “scale”

to denote its more conventional sense of “to alter according to a standard or by degrees; adjust in calculated amounts.” For us, scale is any degree of adjusted innovation that can be expanded flexibly (though not necessarily infinitely) through a combination of digital tools and human interaction.



not transform higher education; instead, such systems must be employed as part of a larger centering focus on engagement and “interest-driven” learning. Merely adding social tools on top of competency-based materials will not transform higher education; instead, social tools must be incorporated in the context of a fundamental vision of social learning, communities of knowledge, and mentorship as shaping contexts for the development of those competencies in and through practice. And merely using analytics and other tracking tools to give shape to the overall degree pathway will not transform higher education, if that remains a mechanical act without a vision of the role that integration plays at the center of higher learning, especially in supporting the new majority of students.

TABLE 1.1. Some Ways Digital Tools Can Support the Core Elements of Liberal Education

CORE ELEMENTS	WHAT THE DIGITAL SUPPORTS	EXAMPLES
<p>Engagement that builds from interest to purpose, knowledge, and capacity for lifelong learning</p>	<ul style="list-style-type: none"> ■ <i>Development of skills and knowledge through inquiry and the creation of Signature Work</i> ■ <i>Engagement with foundational content in personalized environments providing immediate and targeted feedback</i> ■ <i>Student empowerment over their learning, including digital fluency; ability to read, interpret, and use their own data analytics; capacity for expression, sense-making, and networking</i> 	<p>Habitable Worlds is an integrative design that combines simulation tools, virtual field trips, learning analytics underlying adaptive tools, and social learning platforms—with sound pedagogical strategies, such as inquiry-based learning and mentored problem-solving.</p> <p>Open Learning Initiative (OLI), created at Carnegie Mellon University, incorporates adaptive and analytics-driven tools to help students progress more rapidly from basic problems to inquiry projects of increasing complexity. OLI and other adaptive learning systems can advance engagement at scale.</p>
<p>Community and Mentorship that shape the ability to have an impact in the world</p>	<ul style="list-style-type: none"> ■ <i>Social learning at the heart of knowledge-making</i> ■ <i>Ability to create and sustain networks for professional and personal fulfillment</i> ■ <i>Capacity for sharing and engaging feedback on representations of learning, identity, and interests</i> 	<p>Virtual exchange at institutions like St. Edwards University prepares students to communicate, collaborate, and create in digital contexts. Combining video conferencing and asynchronous design, virtual exchange helps students expand intercultural communication and interactive learning on global issues.</p> <p>Inside Track is a “virtual coaching” system that helps connect students to advisors in a cost-efficient way. Coaches work with students to help them create a clear vision of their goals and build academic success skills, providing recursive, analytics-based support and guidance.</p>
<p>Integration that develops the capacity for dealing with complexity and change</p>	<ul style="list-style-type: none"> ■ <i>Connections among disparate parts of an educational experience that contribute to a sense of personal identity and purpose</i> ■ <i>Ability to integrate theory with practice and to discover and demonstrate congruence between values, commitments, and actions</i> 	<p>E-portfolios are much more than sites for storing student artifacts. E-portfolios can be used with integrative reflective pedagogy to help students connect their learning across time, disciplines, and diverse domains, as well as to build the dispositions needed for success and higher-order learning capacities.</p> <p>ProSolo creates an interlocking set of integrative functions that connect planning, social interaction and networking, and competencies to track student progress. Functioning on integrative learning analytics, ProSolo strives to shift as much control as possible to the learner in planning, shaping, and tracking progress.</p>

CHAPTER 2

The Digital Context: Features of the Emerging Ecosystem

The starting point has to be that the abundance of knowledge is a good thing. Full stop.

—Mimi Ito

There are three broad qualities of the digital ecosystem that bear directly on higher learning. The emerging ecosystem is (1) shaped by networks, which are fundamentally social; (2) characterized by horizontal access to creation and production; and (3) increasingly driven by data, algorithms, and artificial intelligence that personalize information for users and inform human judgment. The synergies among these qualities create a new context for liberal learning.

Networks and the role of the social. “We have always lived in a world dominated by networks,” says Howard Rheingold, “from our brain cells to social ties, but we have only recently started to understand how our networked nature affects us.”¹ The emergence of the World Wide Web has taken our human proclivity for living in and exploiting networks to a new level. According to David Ronfeldt, “Network designs have existed throughout history, but multiorganizational designs are now able to gain strength and mature because the new communications technologies let small, scattered, autonomous groups to consult, coordinate, and act jointly across greater distances and across more issue areas than ever before.”² As a consequence, networks have a multiplicative effect on knowledge growth, innovation, and social understanding. They are accelerative and amplifying. As many have observed, the university was built around information scarcity. The growth of proliferating networks means that we now live in an era of information abundance that is not merely about content resources but exponential means for social networks to reproduce, reuse, and remix knowledge.

Horizontal access to creation and production. Just as significant for liberal learning as the role of networks and social learning is the broadened access that humans now have to the tools and platforms to produce as well as consume content. How we as humans can learn and know is now deeply bound up with the horizontal access to creation and production. All people are now producers as well as consumers of content. Students are creators as well as learners. Social learning is inseparable from individual learning, and the web is a tool like any other that extends our individual capacities (another manifestation of what Andy Clark and David Chalmers dubbed the “extended mind thesis”³). More broadly, in a networked age, our life narratives and our communities are shaped and tracked in virtual space. Our ability to tell our stories through a series of data points—timelines, traces, works and artifacts, connections and subnetworks—defines our status as nodes in layered networks of connections. The pervasiveness of networks also gives rise to new challenges, including challenges to individual agency, to the cultivation of an authentic online presence, and to our awareness of the Internet’s role in constructing our reality.



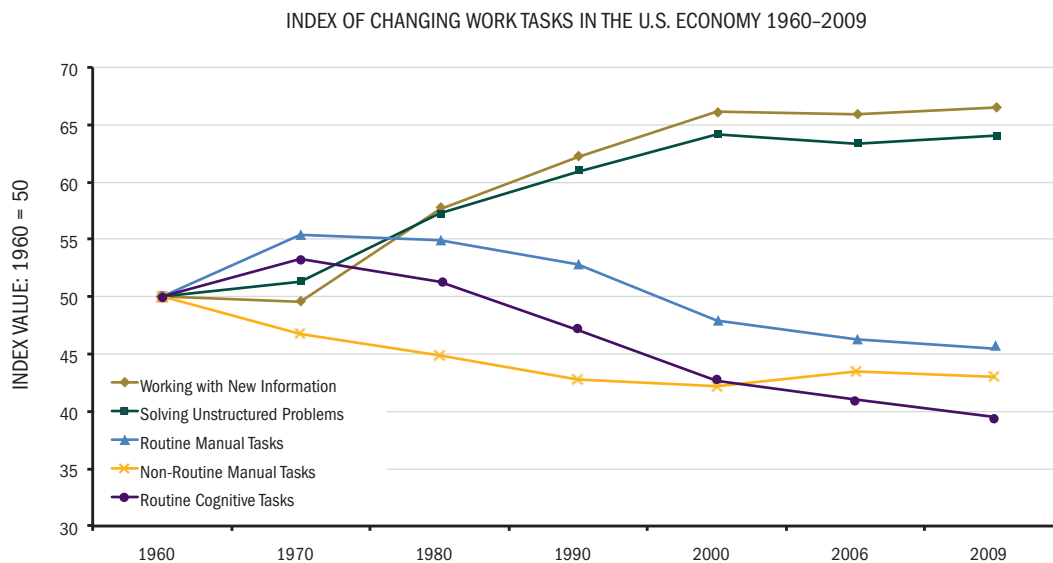
We now live in an era of information abundance that is not merely about content resources but exponential means for social networks to reproduce, reuse, and remix knowledge.

Data, algorithms, artificial intelligence, and human judgment. These drivers of the emerging ecosystem are particularly salient, as data and algorithms are becoming increasingly important forces in our lives. Nearly every aspect of our lives is shaped by data. The interaction of data and algorithms applies to everything from Internet ads and search results to “Fitbit” health trackers. The rapid rise of algorithms based on personal data is giving rise to what Eli Pariser calls “filter bubbles” that shape our sense of reality as personalized algorithmic search engines come to know our digital footprints and increasingly present to us a version of the online world that is specially fitted to our apparent interests.⁴

The phenomenon of algorithmic filtering creates expansive possibilities for machine learning that have broad implications. The emergence of “smart” machines will have a profound impact on the nature of the workforce, for instance, and will also offer opportunities for new human-machine synergies. In many different domains, it has been demonstrated that human judgment is more powerful when it is informed by data and predictive models than when it is exercised alone. The most visible manifestation of this in higher education is the growth in the use of “analytics” to improve learning environments, especially as applied in adaptive learning, predictive analytics, and recommendation engines.

There are several levels of common usage of the term “analytics.” Minimally, it refers to the “data trails” or “data exhaust” that users leave behind as they navigate through any digital system. As a simple record of the traces of use, this is sometimes

The Future of Human Work



Reproduced by permission from Frank Levy and Richard J. Murnane, *Dancing with Robots: Human Skills for Computerized Work* (Washington, DC: Third Way, 2013), fig. 3.

Economists Frank Levy, Richard Murnane, and David Autor examined how changes in the occupational distribution of the US labor force over the last fifty years have shaped the nature of tasks performed by US workers. They argue that the “nature of work” is changing, in part, “because computers increasingly perform the two types of routine tasks while the three other types of tasks remain largely human work.”⁵ As a result, the types of available jobs will continue to diverge.

called “engagement analytics.” This kind of activity may be tracked as a proxy for learning behaviors, but it does not really reflect learning. “Learning analytics” is a more focused usage that refers to the harvesting of data specific to what learners understand in the case of so-called “smart systems” and “intelligent tutors.” When that kind of data is integrated into larger patterns of student behavior and institutional pathways, it becomes what some call “academic analytics” or “institutional analytics.”

Going forward, liberal education cannot be achieved broadly without a critical understanding of the potential role of data and algorithms in shaping institutional designs for learning. This combination of judgment and analytics, qualitative and quantitative data, has to form the new synthesis of advisement, mentoring, instruction, and assessment.

As the unbundling of education continues, colleges will have to respond by shifting attention and resources toward activities that are most directly related to their unique value.

Ubiquitous Learning

The university is now decentered in a larger ecosystem that is characterized by myriad new opportunities for acquiring new knowledge, obtaining or honing skills, opening up subjects, and learning from the world’s greatest experts on complex topics. Higher education itself, of course, contributed to this shifting ecosystem by fostering the explosion of massive open online courses, or MOOCs, and their smaller, closed, and gated spinoffs.

Over the last decade, there has been a vast expansion of web-based educational resources, with offerings that go far beyond MOOCs. New companies and organizations are providing targeted knowledge and resources as well as training in specific fields or subdomains. Corporations are providing extensive ongoing training and certification programs that are focused not only on the acquisition of skills specific to workplace performance, but also on continuous professional development for employees.

These new learning organizations draw heavily on the native capabilities of the web. They modularize learning into manageable units and connect the units through “playlists.” They design targeted degrees—or “nanodegrees,” as Udacity calls them—that are based not on courses but on projects, and that certify what students know and can do. With this growing range of educational options creating an expanded ecosystem, higher education is in an entirely new position.

The Integrative and the Disintegrative

The emerging ecosystem—both the larger global Web and the learning ecosystem forming within it—provides the native conditions for two distinct trajectories into the future of learning. Within this context, networks, data, and modular learning have exerted their greatest influence on the *unbundled* dimensions and services of higher education because they can be harnessed most functionally and scaled most effectively.

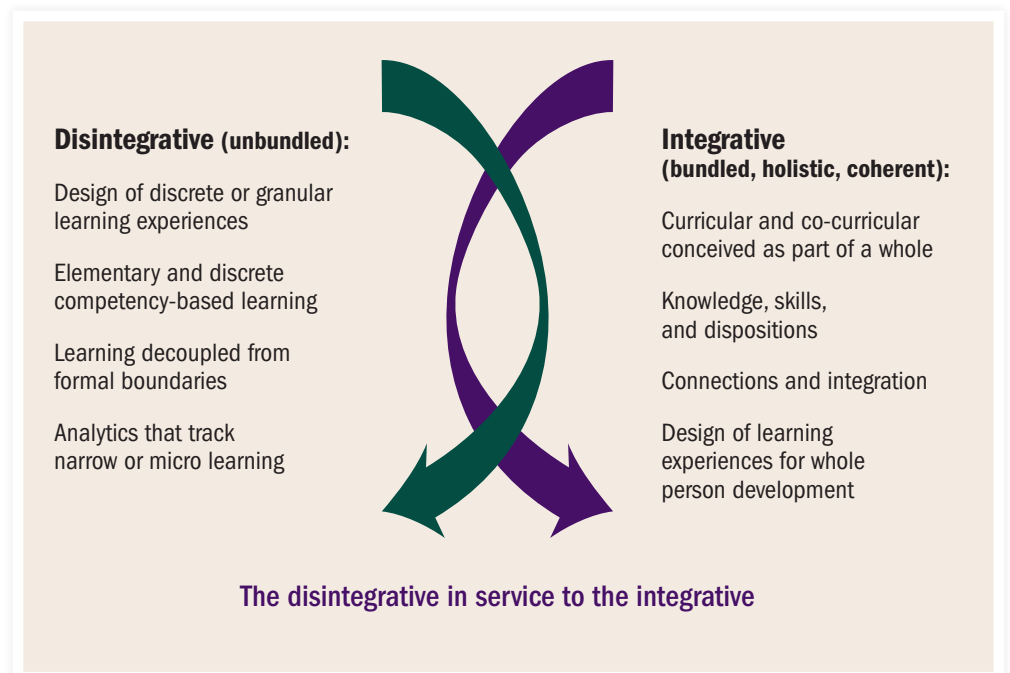
As a consequence, the current situation is marked by a great tension between two educational paradigms: the *integrative* and the *disintegrative*. The focus of the latter is on the quality of discrete or granular learning experiences and on making use of learning science and the affordances of digital environments to optimize the student learning experience. Disintegrative learning environments are driven by analytics, shaped by very concrete learning goals, and tested continuously against the feedback of the learner and against the demands of the workforce.

The *integrative* paradigm, which also has shaped higher education reform in recent years, embraces a broad swath of attention to learning outcomes and student learning at the program and degree levels. The focus is on liberal education outcomes in general, institutional assessment and accountability, and increased attention to boundary-crossing programs across the entire student experience. The overriding emphasis of this paradigm is on the connection and coherence of the student experience, based on both breadth and depth as well as on knowledge, skills, and dispositional development—aggregating, at least; integrating, at best.

It is critical to see both the *integrative* and the *disintegrative* as manifestations of the current age of learning. The central tension between disintegration and integration is not a binary opposition; in the emerging digital ecosystem, they can be deeply interconnected. To take advantage of the digital opportunity for liberal education, we must understand the complementarity of these two streams of activity. The very tools, strategies, and structures that make some unbundled forms of education successful in their own contexts are critical to a necessary institutional shift: colleges and universities need to be re-centered on the distinctive kinds of learning that they alone can foster.

In such a re-centered college or university, and within a broader educational ecosystem that has been digitally transformed, the curriculum can be re-centered on high-impact forms of mentored, inquiry-based learning. To accomplish this, it is essential to recognize the deep interrelation of the core elements of liberal education—engagement, community and mentorship, and integration. Without a

FIGURE 2.1. Rebundling: Toward a New Synthesis of the Integrative and the Disintegrative



commitment to institutional, programmatic, and curricular designs that privilege all three in a mutually reinforcing way, it is unlikely that a focus on any one element will be transformational, no matter what digital tools are used. Indeed, to spotlight any one tool as a solution for advancing isolated elements is to risk exacerbating internal inequities in access to quality learning experiences.

This formulation has at least three key implications for universities seeking a third path in the debate between disruptive unbundling and the allegedly untenable state of institutional higher education. First, as the unbundling of education continues, colleges and universities will have to respond by shifting attention and resources toward activities that are most directly related to their unique value proposition—not merely the transfer of content or skills, but the development of knowledge by engaged communities of learners with guided mentorship in integrative contexts. Second, the realization of this kind of learning will be strongly supported by advances in the unbundled space, especially through adaptive modular forms of learning that will help shift some of the resource expenditure from the transfer of targeted knowledge to the cultivation of deeper understanding. This will be especially important in contexts that are serving new majority students and operating at larger scale. Finally, the growing porosity of institutional boundaries within the larger digital ecosystem will have a bearing on all dimensions of the educational enterprise, from how we develop students’ digital fluency and how we facilitate engagement with larger communities of inquiry and practice to how we structure new partnerships with other educational providers. All of these implications must be considered in designing pedagogical and supportive strategies in the new digital learning ecosystem.

Connected Learning

Based at the University of California–Irvine, the Connected Learning network has established six principles to guide the design of digital learning environments that build engagement, community and mentorship, and integration. As the “openly networked” design principle states, “Connected learning environments link learning in school, home and community because learners achieve best when their learning is reinforced and supported in multiple settings. Online platforms can make learning resources abundant, accessible and visible across all learner settings.”



Reproduced by permission from “Why Connected Learning?” Connected Learning Alliance, accessed April 20, 2016, <http://clalliance.org/why-connected-learning>.

CHAPTER 3

Digital Strategies: Engagement, Community, and Integration

Across higher education, the outlines and key components of a new academy are becoming visible. A host of emerging practices now illuminate strategies that use digital tools to help design colleges that are at once more open and integrative. The most promising examples take advantage of the defining capacities of the emerging digital learning ecosystem to address the core goals and values of liberal education. To take meaningful advantage of the growing power of networked information and algorithmic data systems, we must rebundle our institutions by redesigning the ways we work, collaborate, and structure learning. In rethinking the meaning of individual courses and courses of study, we must seek to advance new ways of engaging and supporting faculty as they rethink teaching, learning, and mentoring, and we must begin to take seriously the role of students as creators, not just consumers, of knowledge.

No one institution has yet addressed the full range of possibilities and assembled them into a cohesive whole. As educators, we all have considerable work to do in order to make the changes needed to scale engagement, mentorship, and integration for all students. To intentionally design and implement the sweeping institutional changes that are needed, it is helpful to examine some small and concrete examples of larger strategies that contribute to larger integrated designs. Organized around the three core elements of liberal education—engagement, community and mentorship, and integration—the sections that follow spotlight examples of how affordances of networked resources, algorithmic-based analytics, creative and expressive environments, and social learning platforms can be used to rethink higher education in the new learning ecosystem.

Engagement and Connected Learning

Engagement in the new ecosystem mirrors what others call “connected learning.” According to Mizuko Ito et al., “connected learning” refers to learning that is “socially embedded, interest-driven, and oriented toward educational, economic, or political opportunity. Connected learning is realized when a young person pursues a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning and interest to academic achievement, career possibilities, or civic engagement.”¹ Connected learning previews the new ecosystem where learners move easily between formal and informal contexts, connect knowledge and lived experience, and deepen learning through engagement with others.

This concept of interest-driven learning is also central to AAC&U’s LEAP Challenge, which calls for every student to do “Signature Work”: “Through Signature Work, students immerse themselves in exploration, choosing the questions they want to study and preparing to explain the significance of their work to others. This process helps students develop the capacities—e.g., investigation, evidence-based reasoning,



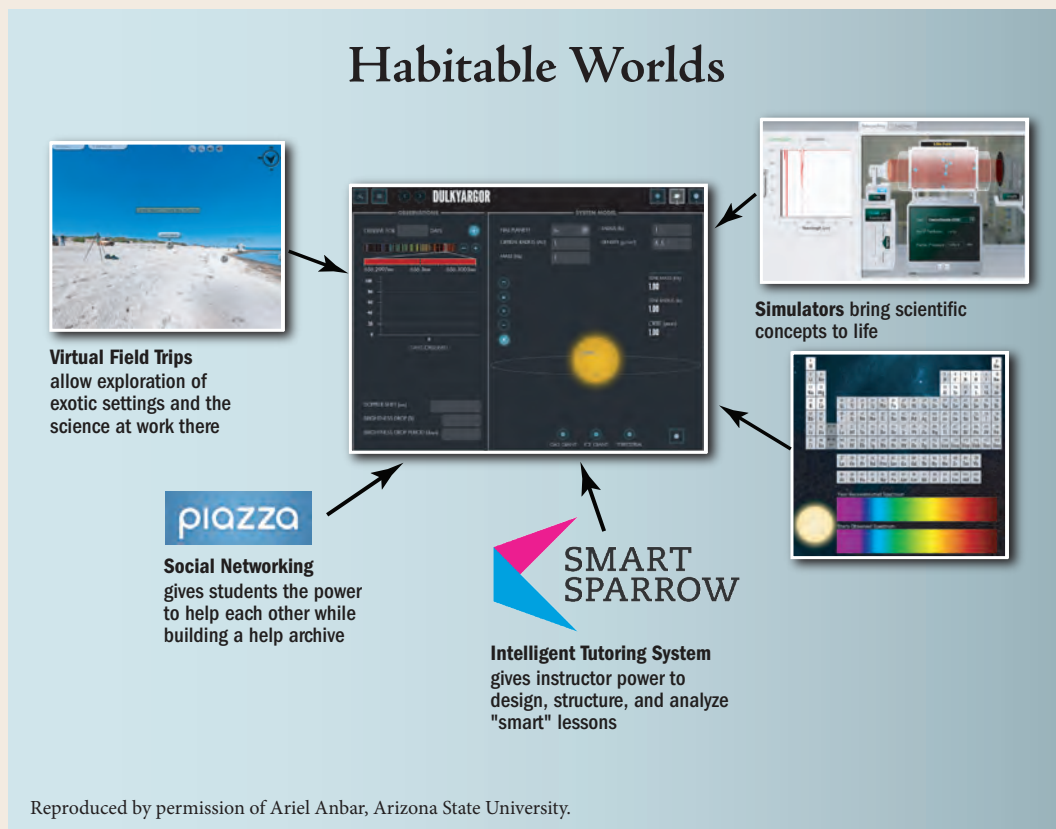
Inquiry learning is a crucial tool for helping all students build the capacities needed to analyze and use complex information, which are critical to thriving in the twenty-first century.

and the ability to collaborate constructively—to grapple with problems where the ‘right answer’ is still unknown and where any answer may be actively contested.”²

AAC&U’s call for Signature Work based on evidence-based inquiry is a timely one. At the exact moment that new majority students are entering college in growing numbers, changing social, technological, and economic environments are putting a premium on preparation to solve complex problems. This requires an education that engages students directly, throughout their curricular pathways, in complex thinking about real-world problems.

AN INTEGRATIVE DESIGN

In Arizona State University’s online science course, Habitable Worlds, inquiry-based learning is integrated into an adaptive analytics environment for the purpose of expanding access to problem-based learning.³ The creation of Ariel Anbar and Lev Horodyskyj, Habitable Worlds is designed to allow non-science majors to fulfill the science requirement of general education through an inquiry-based program that asks them to explore the potential for habitable life on other planets. Habitable Worlds is an example of an integrative design in that it combines a collection of tools that each serve different purposes: simulation tools, virtual field-trips, learning analytics underlying adaptive tools, social learning platforms—with sound pedagogical design strategies, such as inquiry-based learning and mentored problem solving. The purpose, according to Anbar, is “teaching science as a process, not a bunch of facts.” He says that he “wanted to design a course around a quest or a game-like concept where you have to solve a problem.... A good lab does exactly that.”⁴



In *Dancing with Robots*, Frank Levy and Richard Murnane analyze the trends in task-related jobs in the United States over a thirty-year period, looking at the growing impact of intelligent machines on workforce needs. In the future, they conclude, “the human labor market will center on three kinds of work: solving unstructured problems, working with new information, and carrying out non-routine manual tasks.” The bulk of the rest of the work will be done by computers with some work reserved for low-wage workers.⁵

This forecast suggests that the future of the middle class rests on higher education’s ability “to sharply increase the fraction of American children with the foundational skills needed to develop job-relevant knowledge and to learn efficiently over a lifetime.”⁶ As educators, we must maximize the development of what Jonathan Cowan and Elaine Kamarck have called “uniquely human brain strengths, ‘flexibility—the ability to process and integrate many kinds of information to perform a complex task, [such as] solving problems for which standard operating procedures do not currently exist, and working with new information—acquiring it, making sense of it, communicating it to others.’”⁷

In this context, inquiry learning is a crucial tool for helping all students build the capacities needed to analyze and use complex information, which are critical to thriving in the twenty-first century. To help students build these capacities, however, educators must rethink the iterative relationship of complex procedures and diverse kinds of knowledge that make up inquiry and problem solving: engaging real problems; learning to recognize various kinds of problems; developing and using concrete and conceptual content knowledge; developing and using procedural knowledge, including knowledge about how to learn more content knowledge; building affective capacities, such as confidence and resilience; and developing the integrative and reflective capacities that help students connect learning across domains and recognize personal growth over time.

Fortunately, the tools of the twenty-first-century learning ecology, shaped by networked data and adaptive learning systems, make it more possible than ever to effectively engage and support students, in far larger numbers and from a wider range of backgrounds, in critical inquiry processes. Networked systems allow colleges and universities of all types to take advantage of powerful resources for online inquiry. And the granular power of learning analytics can be used to scaffold the inquiry process carefully and to build complex thinking capacities for all students.

The tools of the twenty-first-century learning ecology make it more possible than ever to effectively engage and support students, in far larger numbers and from a wider range of backgrounds, in critical inquiry processes.

Inquiry Learning for All

The networked digital ecology offers unmatched opportunities to engage all students in inquiry and problem solving. Community college students in poor urban neighborhoods and remote rural communities can now access resources previously available only to students at elite institutions with vast library systems. Museums, libraries, and grant-funded resource-development projects are supplementing the explosion of information available on the web, from news media to blogs and YouTube. Faculty who wish to draw on the well-established tenets of inquiry pedagogy no longer struggle to locate rich resources to be used in addressing authentic, real-world problems. The depth and range of inquiry

The Learning Dashboard

The Open Learning Initiative Learning Dashboard allows instructors to track and analyze whole class and individual student data on participation and performance. Quantitative data on the dashboard can inform instructors' decision making, helping them identify topics that are confusing students and see how individual students are progressing.



Reproduced by permission from Open Learning Initiative, "Course Features," Carnegie Mellon University, accessed April 20, 2016, <http://oli.cmu.edu/get-to-know-oli/course-features>.

resources now available on the web are a dramatic example of the porosity of boundaries, which enables faculty to take advantage of learning opportunities organized by others in order to advance key purposes identified by their campus-based institutions.

As more and more resources become available, scarcity of information resources disappears as a problem. A more pressing issue is the need to develop digitally enhanced strategies that effectively help more and different kinds of students analyze and apply information to address authentic problems and build the skills of critical inquiry. Faculty not only need the time and support required to examine resources and scaffold effective inquiry activities for students; they also must find ways to adapt to the open-ended quality of real-world problems. And they can take advantage of new digital capacities for easily authoring powerful visual and multimedia communications. These new tools can not only help students with a key aspect of inquiry learning—demonstrating or performing their new knowledge—but they also can provide opportunities to share that knowledge with audiences beyond the campus boundaries, including community groups, disciplinary experts, and policymakers. This opportunity to build students' digital fluency and realize the power of "authentic tasks" can be a powerful motivating force for all students.

While networked and scaffolded information resources expand the potential for engaging ever-broader groups of students in complex thinking, data analytics can broaden inquiry opportunities and transform the ways educators prepare students to engage in inquiry—integrated with, rather than separated from, the building of basic skills and knowledge.

The Open Learning Initiative (OLI), founded by Candace Thille at Carnegie Mellon University, demonstrates how the inquiry process can be enhanced by the adaptive and analytical tools of new digital systems. OLI has created sophisticated learning resources on topics ranging from anatomy and physiology to psychology. In a July 2014 talk at the Aspen Ideas Festival, Thille explained how the human-machine interaction unfolds, beginning with a problem set—for example, asking engineering students to analyze a situation with three vectors, representing three forces, and determining the direction and magnitude of the sum. “The student types in an answer, and the system immediately tells them that’s not quite right.” The student asks for help. “The system gives them their first-level hint which reminds them of what they’re supposed to be doing. If that’s not enough, they can ask for the next level hint which walks them through the process.” The scaffolded prompts emerge as needed. “At the end, the student now has been able to answer this original question, but we can see they’ve used lots of scaffolding and support. So the system says great that you were able to do this, but we would expect you to be able to do this without all this support at this point in time.... The basic idea is you get a piece of software to act like a good human tutor giving students support when they need it, hanging back when they don’t....”⁸

This opportunity to build students’ digital fluency and realize the power of “authentic tasks” can be a powerful motivating force for all students.

This example, of course, is built on tightly scripted problems, not the messier problems students must ultimately be prepared to tackle. OLI, however, can offer more complex problems, where students must figure out which combinations of procedures should be used, and why. As Thille suggests, “When we’re designing these environments, we also have to give students lots of opportunity not just to learn all these discrete skills, but to synthesize and apply them to solve real-world problems.”⁹

OLI materials have been tested with diverse students at different types of institutions, and they have been shown to produce comparable or superior learning outcomes in significantly shorter time spans. For an introductory statistics class, one report notes, “the results also indicated students experienced a much more effective *and efficient* learning experience in that they showed equal or better learning gain in half the time”¹⁰ This finding is crucial to the challenge of scaling engagement, particularly for new majority students. It points to broader ways of using adaptive data analytics to scaffold students’ preparation for complex inquiry projects more effectively. By helping students progress more rapidly through basic problems and engage with inquiry projects of increasing complexity, OLI and other adaptive learning systems can advance engagement at scale across higher education. This not only would increase the number of students, including new majority students, who are prepared for critical inquiry, but it also would reduce the amount of faculty and class time spent on routine tasks and, thereby, create opportunities to redirect time and energy to advanced inquiry projects customized to student interests.

Another integrative approach to learning analytics has been piloted to good effect in large-scale gateway physics courses at the University of Michigan. A team of faculty, designers, and pedagogical support and research staff engaged in a “four-step process” that included “large data analysis of course records, exploratory interviews to better understand student performance, surveys of students to gather their narratives, and the development of a personalized learning tool,” known as E²Coach (see page 25).

The point is not to replace faculty but rather to re-bundle teaching and learning in ways that enhance faculty's strengths with tools, resources, and the expertise of digital design teams.

E²Coach is a “tailored study support system, customized by prior course-performance data, students’ responses to surveys about their backgrounds and goals, and ongoing physics assessment information.” Using the system in the context of thoughtful approaches to physics education has allowed the instructional team to address issues of success and persistence, particularly around performance gaps related to a diverse student body. “Acting on individual LA [Learning Analytics] results for students requires the ability to personalize interactions at scale. E²Coach enabled us to speak individually to students in a manner informed by their backgrounds, status, and goals.”¹¹

OLI, E²Coach, and Habitable Worlds are examples of what it means to use the powerful capacities of digital tools, targeted to granular concepts and sub-concepts, to support a larger project of inquiry and integration. Harvard technologist Chris Dede points to this dynamic: “By increasing the accessibility and affordability of experiences with higher-level problem-solving, complex decision-making, and learner-based experimentation and exploration, technology-based instruction and practice substantially increases opportunities for learners to focus their attention on the conceptual and analytical capabilities that underlie the deep understanding, retention, and transfer of learning needed to deal with life-long, real-world applications.”¹²

While still in their early phases, these kinds of adaptive and algorithmically sophisticated systems suggest some of the ways new human-machine synergies could help many more faculty advance engaged learning for all students. Adaptive software responds to a student’s actions in ways that not only support the student, but also feed data to faculty and software designers. “The individual student gets feedback based on their data,” Thille explains. The faculty member gets feedback based on the interaction of his or her students. And “the course design team gets feedback based on the interactions of all the students in all of the classes that are using that environment. So they can use it to refine and make the environment better, and also make the ideas underlying the environment better.”¹³

The design team is critical to adaptive learning software. The construction of human-machine synergies demands resources beyond the means of most colleges. The combination of elements in what could be called “interactive learning online”—including machine-guided instruction, cognitive tutors, embedded feedback loops, and some forms of automated grading—requires a partnership between pedagogically skilled faculty and instructional designers, software developers, and programmers. To move most online inquiry and simulation resources to this level of sophistication will require concerted cross-institutional collaboration that elaborates on the insights faculty bring to the teaching and learning process. The point is not to replace faculty but rather to rebundle teaching and learning in ways that enhance faculty’s strengths with tools, resources, and the expertise of digital design teams.

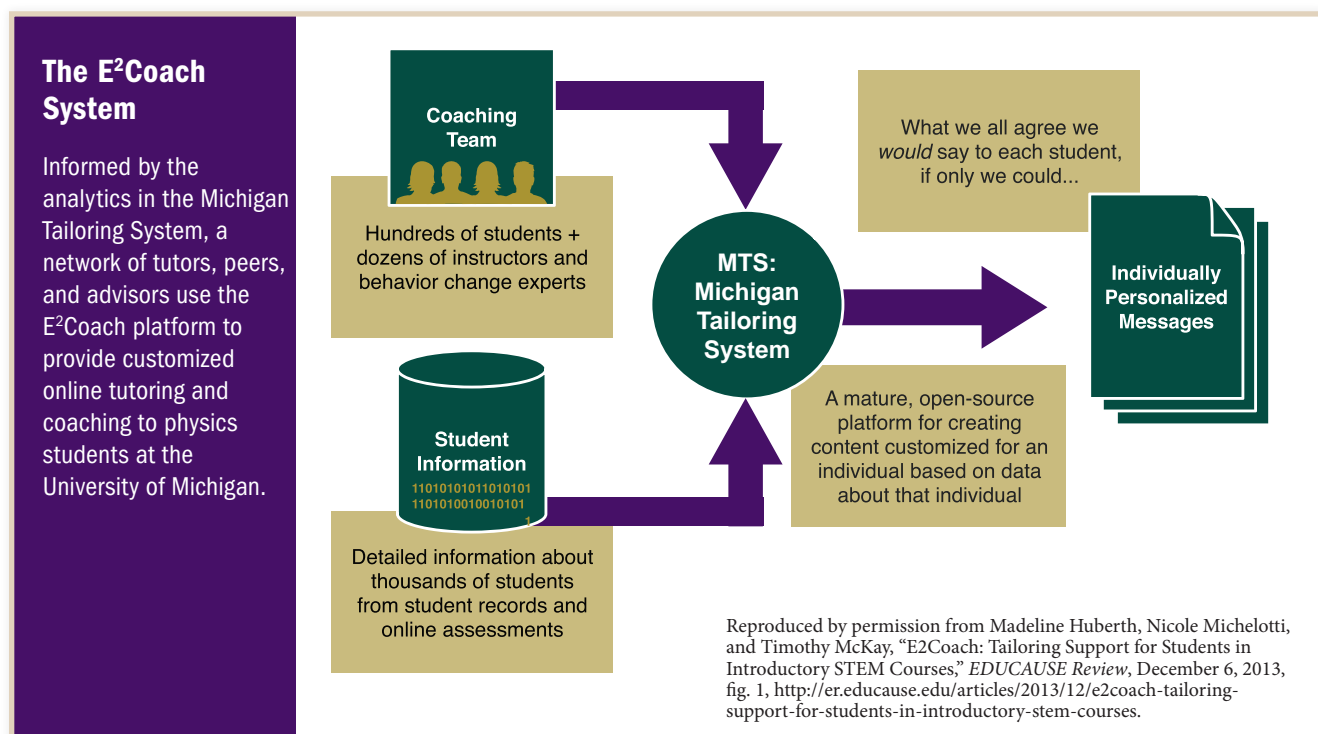
Thille spotlights another aspect of adaptive learning systems: they can provide data to researchers. Aggregated data from multiple learners at multiple institutions feeds a research process focused on understanding how learning happens. The “fourth feedback loop,” she says, is to the science of learning. “The killer app is that if you build these interactions appropriately and instrument them appropriately, you can observe the learner. It’s what Google figured out. It’s what Netflix figured

out. It's what Amazon has figured out. But you don't use these technologies just to push things out, you use it to push it to an interface because in the interface you can observe. And Google, Netflix, Amazon, they're all trying to learn us better, observe us better as consumers. We can use that same approach to observe us as learners, both so that we can make the individual learning experience for that individual better, but also so that we can understand learning better.”¹⁴

Engagement at Scale

The new digital ecology can facilitate the extension of inquiry processes across multiple layers of higher education. As students in a given course immerse themselves in inquiry and problem solving, learning analytics can help faculty and designers engage in evidence-based inquiry into the learning taking place in that course. And the aggregated data can extend and deepen inquiry into the problem of learning itself. Digitally enhanced insight into the nature of learning and learners can advance the effort to more successfully engage all students in critical inquiry and complex thinking.

Possibilities for deep engagement at scale are emerging all around us. Our challenge is to find ways to take advantage of these possibilities and incorporate them into a broader process of redesigning liberal education. Digital resources and learning environments can now connect all students to an ever-growing array of rich databases, archives, and other information sources. More significantly, the emerging digital environment will allow educators to understand “inquiry” or “problem solving” itself as a complex of many abilities, skills, and dispositions. As the strategies demonstrated by OLI and Habitable Worlds become more sophisticated and widely available, we will be able to support an inquiry-centered education as never before by digitally enhancing the holistic endeavor—the combination of meaningful



challenges, complex problems, real data, rich information resources, and expanded machine-augmented mentoring. New digital resources can strengthen components of the inquiry process—by, for example, offering skill-building tools, intelligent tutors, and adaptive systems to track user learning paths—and they can help learners and educators alike connect the parts to the whole through metacognitive reflection, portfolios, and other tools for integrative learning. Powered by these new resources, the critical inquiry processes at the heart of liberal education can take on new relevance and vibrancy for twenty-first-century learners.

Community and Mentorship

If our first digital strategy spotlighted the capacity to more powerfully engage students with inquiry and build complex thinking, the second focuses on ways to strengthen mentoring and move it from the margin to the center—to use granular and networking capacities to address the integrative task of connecting students to advisors, faculty, other students, and other mentoring communities.

There is growing evidence of the importance of social learning and mentoring communities. In the spring of 2014, the first annual Gallup–Purdue Index was released,¹⁶ and its findings have broad implications for higher education. A partnership between Gallup and Purdue University, the index focuses on engagement in the workplace and on “flourishing,” or experiencing high degrees of well-being, across key areas of personal life. Based on a survey of more than thirty

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Virtual exchange combines instruction around and engagement with powerful issues, on the one hand, and on the other, scaffolded mutual mentoring. At St. Edward’s University, for example, instructional designer Rebecca Frost Davis and her faculty colleagues believe that students “must be prepared to communicate, collaborate, and create in the cloud.” They teach in an ecosystem that features advanced video conferencing and complementary synchronous and asynchronous digital communication and collaboration technologies. She points to examples that link community with engagement:

- **Expanded study abroad experiences.** Students in Angers, France, speak with students in Austin, Texas, who will be going to France the following year in order to provide advanced orientation.
- **Intercultural communication opportunities.** Students studying public safety at St. Edward’s University meet virtually with students from the National Defense University in Islamabad, Pakistan.
- **Just-in-time learning on global issues.** Students in the Global Studies Senior Seminar at St. Edward’s participate in a joint seminar with students in Moscow, Russia, to discuss the situation in Kiev, Ukraine.

“The global digital classroom allows faculty, students, and others in locations around the world to come together virtually,” Davis explains.¹⁵



thousand college graduates, the findings spotlight the critical role of connection and community in higher education.

Some of the report's findings are counterintuitive. As the report summarizes, "where graduates went to college—public or private, small or large, very selective or not selective—hardly matters at all to their current well-being and their work lives..." What does matter is the nature of the college experience. "For example," the report notes, "if graduates had a professor who cared about them as a person, made them excited about learning, and encouraged them to pursue their dreams, their odds of being engaged at work more than doubled, as did their odds of thriving in their well-being." The bottom line? "Feeling supported and having deep learning experiences means everything when it comes to long-term outcomes for college graduates."¹⁷

These results underscore the key role of community in higher education. As Michael Feldstein writes, "It really comes down to feeling connected to your school work and your teachers." The lesson is clear: "Obviously, anything that helps teachers and advisors connect with students, students connect with each other, or students connect with their passions is good."¹⁸

The Gallup-Purdue findings also spotlight a challenge: colleges are not, for the most part, successfully creating those connections. Only 27 percent of those surveyed strongly agreed that their professors cared about them as individuals. And only 22 percent reported that they had a mentor in college who encouraged their learning.¹⁹ If connection and community are key, higher education must find more meaningful ways to address these needs. This task is particularly crucial as budgets constrict and new majority students arrive on campuses. Fortunately for higher education, recent years have witnessed a proliferation of new ways learners can communicate, collaborate, and connect with others.

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Mentoring and Connecting in the Digital Environment

At small elite institutions, the traditional vehicle for faculty-student connection is advisement or mentorship. Such relationships are rare at large public institutions, however—especially at community colleges, where students most need connection and support. And even at elite institutions, as the data suggest, mentoring often takes place on the margins, pushed aside by other priorities. Combinations of digital networks and data systems may provide key tools that can help faculty, advisement professionals, and peer mentors support the new majority student.

Shanna Jaggars, Melinda Karp, and Serena Klempin of the Community College Research Center (CCRC) have studied advising in under-resourced institutions. "Most public colleges struggle with the challenge of providing sufficient interpersonal support to their students; for example, most community colleges can afford to fund only 1 advisor for every 800 to 1,200 students," writes Jaggars. For confident, motivated, high-achieving students, the lack of support may not be problematic. "However," she argues, "low-income, ethnic minority, or first-generation students—that is, most community college students—are often anxious about their ability to succeed academically, and this anxiety can manifest in counterproductive strategies such as procrastinating, not turning in assignments, or not reaching out to professors for help."²⁰

Digitally enhanced peer mentoring suggests a broadened understanding of who is involved in mentoring and where mentoring takes place.

New digital systems can help. Recent years have seen the emergence of analytics tools designed to bolster advisement, including Starfish and the Student Success Collaborative offered by the Educational Advisory Board (EAB). Jaggars and CCRC call these systems Integrated Planning and Advisement for Student Success, or IPASS. According to EDUCAUSE, IPASS systems use “the tools of academic analytics—including notifications and interventions” and integrate “the activities of education planning, advising/counseling, and early alerts.” Relying on accurate, timely data, an IPASS system “coordinates the functions of various systems, including degree audit/progress tracking, course recommendations, and advising management.”²¹

IPASS solutions use “data dashboards and other tools to visually represent the information to students and to faculty and advisers. Some systems offer self-service tools for students to compare their status to that of peers or other benchmarks.” By putting contextualized information into the hands of faculty, advisors, and students themselves, IPASS systems help advisors guide students in “effective program planning” and connect “holistic support to promote students’ progress towards a degree.”²²

Research shows this can make a difference. Georgia State University (GSU) implemented the EAB system to support restructured advisement and saw dramatic gains. Working with low-income and minority students, GSU moved its six-year graduation rate from 32 percent to 54 percent.²³

However, like most new digital innovations, IPASS systems don’t work on their own. Karp and Klempin suggest that these tools only work when accompanied by changes in institutional structure and individual practice. The dramatic improvements at Georgia State, according to researchers, were in part the product of the new digital tool, but they also reflected a sustained process of institutional self-assessment and reform.²⁴ As Karp and Klempin conclude, “technology in and of itself will not lead to significant changes; colleges must approach the implementation of that technology as a means of changing practice.”²⁵

Mentoring Communities

Jaggars calls for linking sophisticated advising analytics with peer-mentoring communities. This option is particularly important for under-resourced institutions serving first-generation and low-income students. Putting e-advising systems in the hands of successful community college students who have completed a specific curricular path, and connecting them with students who are pursuing a similar path, “may well help to overcome the lack of ‘social know-how’ or ‘college knowledge’ that disadvantages many low-income and first-generation college students.”²⁶

Digitally enhanced peer mentoring suggests a broadened understanding of who is involved in mentoring and where mentoring takes place. Sharon Daloz Parks argues that it is increasingly “essential to recognize higher education as a mentoring environment where young adults search for meaning, purpose, and faith during their formative college and university years.” She points to what she calls “mentoring communities,” seeing opportunities in research and study groups, student clubs, sports teams, and service-learning groups. “The academy may be

understood as an environment where multiple mentoring communities serve the process of moving from adolescence into a significant adulthood.”²⁷

Rethinking the place of mentoring and taking full advantage of new e-advisement tools involves a form of rebundling, connecting the efforts of often disconnected groups—including advisors, peer mentors, and faculty—and moving currently marginal practices to the center of higher education. Parks’s thesis implies a broadened commitment to linking students across traditional lines, developing new partnerships between academic and student affairs, and rethinking mentorship to focus on networks and communities. This new learning ecology has transformative implications for the role of faculty. In a transformed ecosystem, one of the distinguishing qualities of colleges and universities is that they can offer new forms of guided and mentored learning, forms based on a new understanding of faculty-student interaction.

Social Pedagogy

To date, most digital learning systems treat social learning tools as add-ons, perhaps because some instructors treat classroom interaction as an afterthought. But there is an intrinsic role for social learning. More than ever, digital tools can support “social pedagogies,” which Randy Bass and Heidi Elmendorf describe as design approaches for teaching and learning that engage students in authentic tasks that are communication intensive and where the representation of knowledge for an authentic audience is absolutely central to the construction of knowledge in a course. As they explain, “Social pedagogies build in iterative cycles of engagement with the most difficult material, and through a focus on authentic audience and representation of knowledge for others, help students deepen their understanding of core concepts by engaging in the ways of thinking, practicing, and communicating in a field. Ideally, social pedagogies strive to build a sense of intellectual community within the classroom and frequently connect students to communities outside the classroom.”²⁸

Over the past five years, the number of available digital tools for communication, creation, and collaboration has exploded. Social media from Facebook and Twitter to Pinterest and Snapchat engage millions of young people every day. Mobile technology opens the opportunity for virtually everyone to direct his or her own web-published videos. Web conferencing and collaboration tools make it increasingly easy to combine image, text, voice, and multimedia from multiple sources in real-time dialogue across vast distances.

Experiments with NovoEd, Stanford University’s massive open online course (MOOC) initiative, have shown that social learning can be combined with project-based learning in a massive online environment. The NovoEd environment is specifically designed with features intended to enable “collaboration and peer learning through team-based exercises, calibrated peer evaluation and feedback, visible student work, forums for the exchange of ideas, and direct communication among students.”²⁹ As is true with most digital learning tools, however, the value of NovoEd depends significantly on the intentional deployment of social pedagogy by faculty.

Communities that combine learning and mutual support are no longer limited to campuses. The interplay between community and engagement enables students to collaborate and communicate as they grapple with real-world problems.

Teaching management science and engineering at Stanford, Tina Seelig uses tools developed through the NovoEd initiative in a MOOC; her course description emphasizes the importance of collaboration and experiential learning, and she requires each student to work in an online team.³⁰ Building in broad online engagement, she uses the NovoEd tools to support peer conversation and feedback, encouraging students to answer each other's questions. "I need to deputize everyone in the class," Seelig explains. "So I essentially say, collectively all of you know much more than I do. . . . You end up with a whole collection of folks who are helping each other."³¹ Using a shared grading rubric, students evaluate each other's projects through a peer review process. The process, Seelig argues, helps students take ownership of the course and enrich its content, drawing on their research and their own experiences.³²

An evaluation of the NovoEd experiment by the University of Pennsylvania's Anne Trumbore showed that social pedagogy helped address MOOCs' most salient problem—astronomically high drop-out rates. According to Trumbore, "In MOOCs that used collaboration, peer review, and a final project with applications both inside and outside the classroom, 33 to 63 percent of students who completed the first assignment persisted through subsequent ones to complete the course." What keeps students engaged? Nothing that would surprise learning designers or pedagogy experts: "frequent formalized opportunities for collaboration among students for peer learning, the cohesion of assignments that connect to an open-ended final project with meaningful applications inside and outside the course, and the creation of a learning community."³³

Digitally supported social pedagogy is being pioneered across the stratified levels of higher education. At Guttman Community College in New York City, for example, students use e-portfolios to review each other's experiential learning projects and build understanding of the role of art in an urban environment. Habitable Worlds, the online course discussed above, combines a social platform with its own competency-based and virtual simulation platforms. In keeping with its goal of emphasizing inquiry process over content, Habitable Worlds seeks to create "a self-sustaining knowledge community among the students."³⁴ Biology students at Pace University do research and develop multimedia educational resources for other students, collaborating and ultimately making their work available to future classes through the web. The process of peer response and social interaction deepens individual work and collectively produces artifacts for authentic audiences, and it goes further by helping students organize themselves into supportive, expert-like communities of practice.

From Stanford and St. Edward's to Guttman Community College, these examples highlight the ways diverse kinds of communities can now come together to support each other in the learning enterprise. Communities that combine learning and mutual support are no longer limited to campuses. These examples also remind us of the interplay between community and engagement, which enables students to collaborate and communicate as they grapple with real-world problems.

The combination of new networking systems and intentional social pedagogy can help us move mentoring communities to the core of education. We can now synergize evidence on the power of communal learning with the native and scalable

capacities of social learning technologies. Emergent digital tools empower students across higher education to establish powerful connections on their own campuses, on other campuses, and in the broader world as well as to collaborate in the construction of understanding. Integrated with sophisticated systems to support engagement, these approaches offer new ways for students to collaborate in communicating and constructing understandings. These approaches do not erase deep-rooted lines of class and privilege. But the abundance of available tools and broadband connectivity does create rich opportunities to connect across those lines and to engage all students with the power of thoughtful, digitally enhanced social pedagogy.

Integration from the Inside Out

If the first digital strategy is to connect students with real-world content and complex thinking, and the second is to connect them with other people, the third digital strategy focuses on integration: the ability to connect different forms of learning and weave them together into a deeper understanding of the self. For digital strategies to become transformative, we must find ways to connect what is often left unconnected. Countering the disintegrative tendencies of the current digital context, higher education must find ways both to link formal course-based learning with informal learning and personal development, and to synthesize cognitive science with emerging insights into the affective dimensions of learning and identity development.

Within higher education, integration and integrative learning have come to imply the value that comes from making connections and enabling students to make a higher order of meaning. Integration is the highest level of learning as *relational*. Connections between theory and practice matter if students have guidance in using theory to inform their experience and if they reflect on their experience to deepen their understanding of theory. Personalized pathways matter if learners can make meaning of those pathways as they form a larger sense of purpose. Integration is the third core value that distinguishes higher education in the new ecosystem for which we must start to design with greater intention.

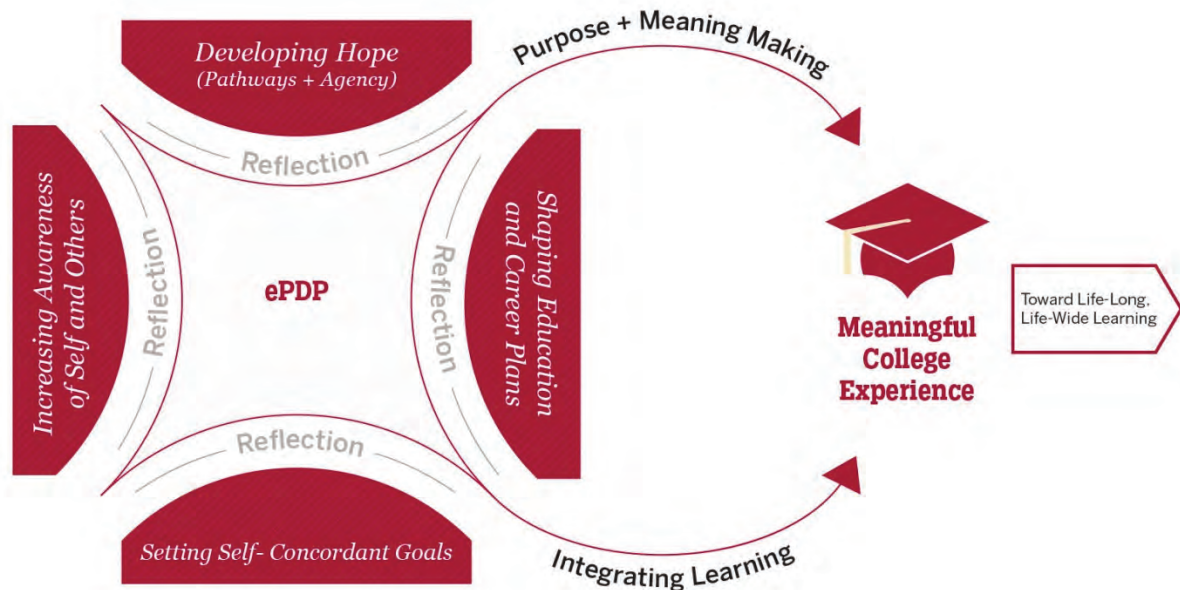
To more fully exploit the distinctive potential of higher learning as an integrative environment, we need to recognize integration as a design goal that is possible to achieve in new ways within the new learning ecosystem. We have to consider nearly every learning experience as potentially integrative—crossing boundaries of knowledge, skills, and broader interpersonal abilities. Tools now exist—and will increasingly dominate the learning landscape—that enable students to track their learning, build representations of their education, and connect their developing competencies in academic settings to the world beyond graduation.

Connecting Learning and Identity Development

Integrative learning is drawing new recognition across higher education. Surveys show that employers value education that helps students integrate and transfer knowledge and skills from one setting to another. “Connected learning” highlights the power of connecting learning in formal and informal environments with the interests of the learner.

Conceptual Model for the IUPUI electronic Personal Development Plan (ePDP)

July 2013



This conceptual model is informed by best-practices in ePortfolio pedagogy including interactive and social pedagogies, reflection, authentic audience and feedback, as well as the framework provided by "The Learning Partnerships Model" (Baxter-Magolda & King, 2004).

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At Indiana University–Purdue University Indianapolis (IUPUI), e-portfolio leaders developed a reflective planning tool, the Personal Development Plan (ePDP). Used in IUPUI's first-year experience program, the ePDP provides a structure for helping students engage in sustained reflective inquiry into their goals and their learning. Guided, as the above graphic indicates, by the work of Marcia Baxter Magolda on purposeful self-authorship,³⁵ the ePDP has seven sections, including "About Me," "Educational Goals and Plans," "Campus and Community Connections," and "My College Achievements." Each section includes prompts to guide students in considering their lives and developing a more purposeful approach to their education.

IUPUI uses the ePDP for advisement, helping students reflect in order to develop a clearer sense of purpose and pursue what they want from their college experience. Year by year, students complete more of the ePDP, discussing it with faculty, advisors, and other students. Each section asks students to include and reflect on artifacts documenting high-impact learning experiences, ranging from classrooms assignments to service learning and undergraduate research. Linking learning with support, reflection, and exchange, the process has been shown to be particularly beneficial to high-risk students: "As students complete the ePDP, writes IUPUI's Cathy Buyarski, 'reflective prompts assist them in bringing narrative to their lives and aspirations.' The content of the ePDP, she argues, is 'in essence the students' self and understanding of self.... The student is firmly at the center of this narrative.'"³⁶

Researchers from Carol Dweck to Marcia Baxter Magolda have demonstrated that powerful learning involves affective as well as cognitive dimensions.³⁷ Educational success, particularly for first-generation students, requires the development of crucial habits ranging from surface behaviors, such as study skills and time management, to habits of mind or dispositions, such as resilience, help-seeking, self-regulation, and metacognition. Ultimately, powerful learning depends on the integration of the cognitive and the affective, the connection of academic learning with students' own experiences and developing sense of their own capacities.

In most institutions, attention to this kind of development is marginal and underfunded, assigned to student affairs and invisible in the classroom. Don Harward has argued, however, that these “non-cognitive” aspects of learning in fact resonate with the deepest visions of liberal education. He highlights the importance of going beyond disciplinary knowledge and “focus[ing] on the integration of learning and its connection to the full development of the learner.” The learning at the heart of liberal education, he argues, “positively affects the flourishing, the senses of identity, the persistence and resiliency, and the self-realization of the learner—behaviors, dispositions, and actions that point away from the presumptions of dualism and argue for the consideration of the learner as an integrated whole.”³⁸

Elite colleges once sought to be highly attentive to this task. To be meaningful in the twenty-first century, higher education must once again prioritize such learning and now make it available to all, within and across classrooms. First-generation college students, who often come from communities scarred by poverty, benefit the most from practices that integrate learning with support and identity development. For these students, what is needed is not an unbundled education, but rather a digitally enhanced integrative learning environment that helps them develop higher-order thinking capacities and the dispositions of successful learners.

Ultimately, powerful learning depends on the integration of the cognitive and the affective, the connection of academic learning with students' own experiences and their developing sense of capacity and purpose.

Course-Level Integration

“What does learning look like when you understand the goals and you care about them?” That’s the question that interests Constance Steinkuehler, codirector of the Games+Learning+Society Center at the Wisconsin Institute of Discovery.³⁹ This question has emerged from her research on adolescent boys who are disengaged from school but read college-level texts in the context of games. Her research, Steinkuehler cautions, does not suggest that all content should be taught through gaming. There’s “too much hype” around gamification, she believes. What makes games effective is not that they are goal driven, but that they use goals to drive user-motivated exploration. “If you want students to explain to you what’s on a multiple choice test, I can think of a lot more efficient ways of doing that than creating a game.”⁴⁰ The power of gaming is in exploration, in part because that is where users (or students) are engaged both cognitively and affectively.

Similar values motivate Connected Courses: Active Co-Learning in Higher Ed, a community of practice linking faculty and instructional designers. Building on the principles of connected learning, Connected Courses members experiment with scaled learning communities involving high-quality, socially connected digital learning. Open courses are built on exploration and construction, marshaling

multiple tools, peer mentoring, and project-focused learning. The emphasis is not merely on students learning the skills and knowledge for engaging in Signature Work, but also the *dispositions* of open-ended learning in a scaffolded and community-mentored environment.

Open and connected courses embody the principle of “integration from the inside out” by prioritizing the incorporation of deep-learning experiences for students. Such an environment invites students to bring their full selves to the “classroom” and to use a wide variety of digital tools—from dialog and social media tools, to resource-sharing tools and authoring or constructive tools—to activate connections between learning and identity development.

Both Steinkuehler’s work on games and the Connected Courses initiative signal some of the ways emergent digital tools can facilitate pedagogical practices that can make all high-impact courses intrinsically integrative. Project-based learning that engages authentic, real-world problems—including complex global challenges—makes space for students to bring lived experience to bear on the course material and to make visible the impact that complex material is having on their sense of themselves as agents in the world. Any course that uses digital tools to build in connection and reflection can deepen learning through integration. As higher learning courses increasingly distinguish themselves from other kinds of courses, the strategies for deepening integration will only increase in importance. And as we learn more about digitally generated learning analytics that register social learning, persistence, resilience, and civility, we will have even more tools at our disposal to help students—and faculty—make each course experience integrative.

For first-generation college students, what is needed is not an unbundled education, but rather a digitally enhanced integrative learning environment that helps them develop higher-order thinking capacities and the dispositions of successful learners.

The Integrative Platform: Portfolios and Personalized Learning

Designing for integration within courses is valuable. The even greater digital opportunity for integration lies in being able to think beyond the boundaries of the discrete course in order to consider connections across courses and linkages with other types of learning experiences. In this regard, the most powerful tool that has emerged is the electronic student portfolio, or e-portfolio. Understanding the impact of sophisticated e-portfolio practice can advance our effort to envision more integrative, digitally enhanced designs for twenty-first-century liberal education.

More than 50 percent of American colleges and universities now use some sort of e-portfolio system. But many, if not most, use e-portfolios primarily for the storage of student artifacts for assessment purposes and fail to grasp their potential as a transformative learning tool. Consequently, e-portfolios are often left out of discussions of “hot trends” in education technology.⁴¹

An e-portfolio can be much more than a site for storing student artifacts, however. When combined with integrative social pedagogy, next-generation e-portfolio practice can play a critical role in transforming the learning experience. By helping students connect their learning across time, disciplines, and diverse domains, it can also help them build the dispositions needed for success and higher-order learning capacities.

The integrative e-portfolio practice needed for the twenty-first century is emerging at institutions of various types, including LaGuardia Community College,

Boston College, Portland State University, Duke University, Salt Lake Community College, the University of Central Oklahoma, the University of Michigan, Guttman Community College, Indiana University-Purdue University Indianapolis, and San Francisco State University. Connect to Learning (C2L), a project supported by the Fund for the Improvement of Postsecondary Education, joined many of these campuses in a systematic, multiyear effort to identify a set of strategies that make the use of e-portfolios a transformative practice for student, faculty, and institutional learning.⁴²

As is recognized on C2L and other campuses, the core of integrative e-portfolio practice is reflection. Jack Mezirow, John Bransford, and others have confirmed Dewey's insight into the critical role of reflection in transformational learning.⁴³ To advance sophisticated e-portfolio practice, the C2L network tested reflective pedagogies that were structured to address a framework developed by Dewey scholar Carol Rodgers, which highlights four principles: reflection as connection, reflection as systematic and disciplined, reflection in community, and reflection as an attitude toward change. In combination, these principles position the dynamic between experience and reflection as the core of deep learning: "The function of reflection is to make meaning, to formulate relationships and continuities among the elements of an experience, between that experience and other experiences, between that knowledge and the knowledge produced by thinkers other than oneself.... The creation of meaning out of experience is at the very heart of what it means to be human. It is what enables us to make sense of and attribute value to the events of our lives."⁴⁴

E-portfolio practices that effectively draw on these principles make student learning visible to students themselves and to faculty and mentoring communities. Guided processes of reflective self-examination, connected to diverse curricular and cocurricular learning experiences, engage students in goal setting and educational planning, and they support advisement by helping students develop the dispositions needed for success. The connective capacities of reflective e-portfolio practice help students synthesize different parts of their learning and examine their own processes of growth and development, connecting inquiry into authentic problems with an inquiry into the self. Building on this transformative level of inquiry, embedded multimedia tools support empowering new self-representations.

Testing integrative e-portfolio practice with more than 110,000 students at diverse institutions across the network, C2L teams found significant gains in student learning and success. The impact was most pronounced at community colleges and other institutions serving students who face the steepest challenges in higher education. Meanwhile, across institutions, overwhelming majorities of students reported that the e-portfolio process helped them create a more integrated learning experience. The e-portfolio experience helped students make connections between ideas, think in new ways, and deepen their understanding of course content. Perhaps most important, students reported that the e-portfolio experience helped them see the connection between their coursework and the rest of their lives.⁴⁵ Supported by thoughtful faculty and communities of peers, integrative e-portfolio practice has transformed the learning experience for thousands of students across higher education.

An e-portfolio can be much more than a site for storing student artifacts. By helping students connect their learning across time, disciplines, and diverse domains, it can also help them build the dispositions needed for success and higher-order learning capacities.

E-portfolios, Social Pedagogy, and Integrative Learning

The Connect to Learning project surveyed students on multiple campuses on their use of e-portfolios and the ways it shaped their learning. Data from sample questions presented top right suggest that high-impact e-portfolio practice helps students engage in integrative learning—making connections between ideas, linking classroom learning to practical problem solving and deepened self-understanding. The graph at bottom correlates one such question about integrative impact with high levels of feedback from faculty and peers, suggesting that the use of e-portfolios with social pedagogy dramatically enhances engagement with integrative learning.

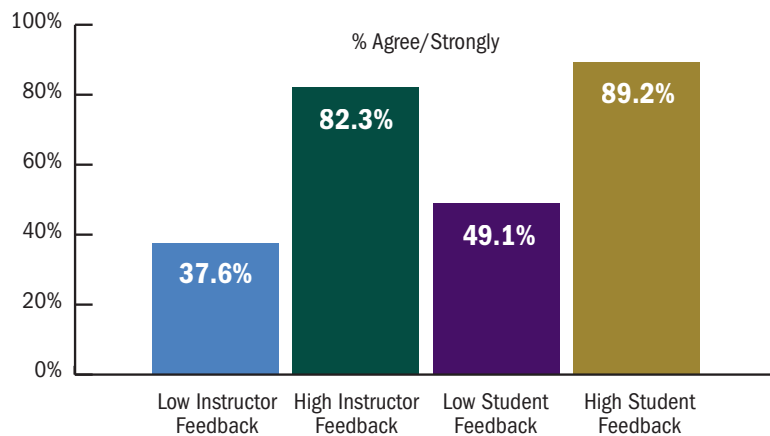
Connect to Learning Core Survey

n = 10,170

Building my e-portfolio...	% Agree or Strongly Agree
Helped me make connections between ideas	75.6%
Helped me think more deeply about course content	64.4%
Allowed me to be more aware of my growth and development as a learner	69.3%

My (e-portfolio-enhanced) course engaged me in...	% Quite a Bit or Very Much
Synthesizing and organizing ideas, information, or experiences in new ways	83.1%
Applying theories or concepts to practical problems or in new situations	77.2%
My course contributed to my knowledge, skills, and personal development in understanding myself	78.6%

Building my e-portfolio helped me to make connections between ideas...



Reproduced by permission of the Making Connections National Resource Center, LaGuardia Community College.

The impact of the use of e-portfolios on student learning and development suggests the possibility of thinking in new ways about the connections among digital learning, liberal education, and what Marcia Baxter Magolda calls “purposeful self-authorship.” In an article coauthored by David Hodge and Carolyn Haynes, Baxter Magolda highlights the relationship between learning and an evolving sense of self and identifies the capacity for purposeful self-authorship as “an internal set of beliefs that guide decision making about knowledge claims, an internal identity that enables them to express themselves in socially constructing knowledge with others, and the capacity to engage in mutually interdependent relationships to assess others’ expertise.”⁴⁶ Her strategies for promoting self-authorship include

- providing opportunities for students to reflect on and express their learning experiences;
- having students reflect on *how* they learned, in addition to *what* they learned;
- helping students set attainable but challenging goals, visualize and plan for potential obstacles, and reflect on outcomes.

Purposeful self-authorship extends beyond the academic realm, helping students develop an inner voice and the internal commitments needed to function as empowered individuals. Building a stronger sense of self, reflective self-authorship also develops capacities related to initiative and self-direction, risk-taking and resilience, critical empathy and engagement with difference. These habits of heart and mind are critical not only for college success, but also for intentional lifelong learning and students’ capacity to shape society and their own lives. Higher education can no longer allow anachronistic divisions between learning and development and between academic affairs and student affairs to block a focus on such critical social and institutional goals.

Two other facets of e-portfolio practice also suggest lessons for the broader digital environment. C2L research on the student e-portfolio experience found that the impact on student engagement in reflective and integrative learning experiences was transformed by the incorporation of social pedagogy practices. Reflective use of an e-portfolio is traditionally understood as a private experience; but C2L showed that campuses that experimented with reflection in community, through social pedagogy, were able greatly to multiply the impact of the experience.⁴⁷ Connecting integrative e-portfolio practice with social pedagogies can transform knowledge communities into mentoring communities. This underscores once again that engagement, community, and integration are best understood not as distinct processes, but as mutually reinforcing elements in a unified body of transformative practice.

Significantly, campuses such as Notre Dame and LaGuardia are looking to harness the power of learning analytics to strengthen integrative e-portfolio practice.⁴⁸ As analytics begin to address the latest insights into both the cognitive and the non-cognitive aspects of learning, they may illuminate the integrative processes that are so crucial to liberal education. Moreover, analytics will gain in power when we develop ways for students to use them—perhaps through their e-portfolios—to examine their own behaviors, compare them with those of others, and consider the implications. Ultimately, analytics will be most meaningful when

Purposeful self-authorship extends beyond the academic realm, helping students develop an inner voice and the internal commitments needed to function as empowered individuals.

they are combined with reflective and integrative processes, providing students with a range of evidence and combining short-term feedback with long-term perspectives on their learning.

Alternative versions of integrative platforms are emerging from similar impulses that drive e-portfolio practices, but focusing on helping students chart their own pathways through various kinds of degree programs. ProSolo is a tool in the early stages of design and testing that attempts to create an interlocking set of integrative functions that connects planning, social interaction and networking, competencies, and various ways to track student progress. Designed by George Siemens and Dragan Gasevic, ProSolo functions on integrative learning analytics and strives to shift as much control and intentionality as possible to the learner in planning, shaping, and tracking progress through programs. In ways that are consonant with the role of e-portfolios in helping students to integrate the disparate elements of their education, ProSolo seeks to be an integrative platform that enables the “unbundling” of degrees, courses, and programs and “reconnects” them in ways that learners could control.

Engagement, community, and integration are best understood not as distinct processes, but as mutually reinforcing elements in a unified body of transformative practice.

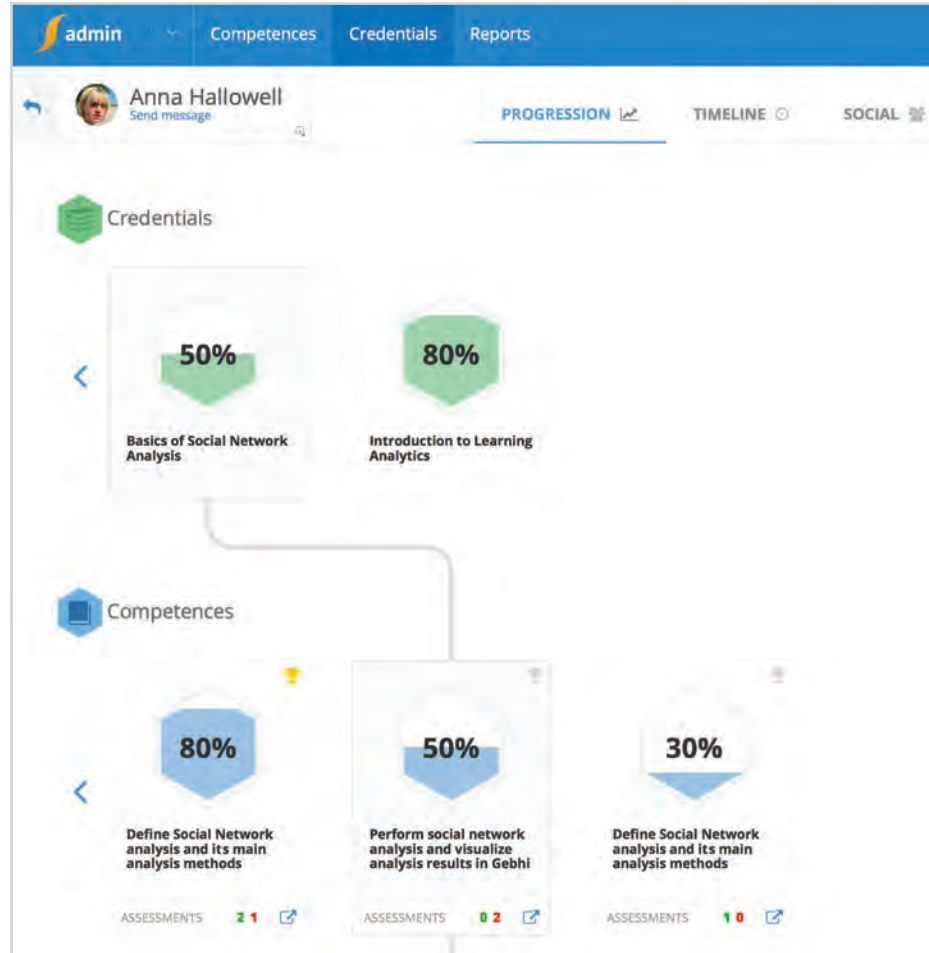
The evidence associated with well-developed e-portfolio practice, as well as the promise of early designs of a tool like ProSolo, open up and make robust the concept of personalized learning, which can be both overused and underconceptualized in commoditized digital tools. As Audrey Watters puts it, “Often what I see the term applied to gives me pause—‘personalized learning’ appears to be more focused on the scripting than on the student.

Personalized learning isn’t personal learning. And often it’s really ‘personalized instruction’—not focused on the person or the learning but on individualized delivery of standardized content and assessment.”⁴⁹ E-portfolios and other emergent integrative platforms provide spaces for students to control their learning as well as for institutions to harvest evidence of student pathways through the curriculum.

Integrative platforms like these point to ways educators can attend to integration as a signature element in twenty-first-century higher education. But such possibilities for integrative learning can only be realized if we undertake the challenging task of constructing more integrative institutions of higher education. As educators and leaders of colleges and universities, our task is to design environments that transcend the limitations of a single course, engage learning as an iterative process with a broader time horizon, and link a range of formal and informal learning experiences. And to make integration meaningful, we must find ways to ensure that new learning environments facilitate reflective self-authorship and that students’ identities on campus are connected to their evolving identities in the community and the society. Whatever the role of e-portfolios in the emerging digital ecology, these features are critical to higher education’s capacity to connect what has been all too often unconnected and to engage all students in a powerful process of integrative self-authorship.

ProSolo Learning Platform

To empower learners as they make their way through curricular pathways, the experimental ProSolo learning platform combines degree information, personal achievement, progress markers on a range of learning dimensions, and social tools that can connect student achievements to peers and mentors. A student's record may show progress in building expected competencies and attaining desired credentials (as shown here) as well as a range of other functions to put as much control as possible in the hands of students for guiding their way through the curriculum.



Reproduced by permission of George Siemens and Dragan Gasevic.

CHAPTER 4

Learning Organizations: Faculty Development and Outcomes Assessment

Our capacity to take full advantage of any of the digital strategies for engagement, mentoring, and integration will depend in large part on whether faculty and institutions engage productively in a process of learning, adaptation, and change. Some of those who are enthusiastic about the digital disruption of higher education seem to view faculty mainly as an obstacle to be overcome, a group whose role in the educational process needs to be significantly reduced. Yet, the Campus Computing Survey suggests otherwise: “There is plenty of untapped demand, however, for digital instructional resources and adaptive learning products; over 94 percent of respondents believe these tools can deliver better student outcomes. But just 10 percent of general-ed courses currently use digital courseware—and only 4 percent use adaptive tools. And only 6 percent of courses make use of open educational resources, even though 38 percent of respondents say their schools encourage faculty to do so.”¹ The problem is not about resistance but adequate support and incentives for integrating effective tools and resources into current teaching practices.

Faculty must be supported in learning about, adapting to, and taking on crucial new roles, and their institutions must commit the resources and attention required to design, implement, and sustain the kinds of professional development and outcomes assessment processes needed to translate emerging opportunities into meaningful student, faculty, staff, and institutional learning.

Our focus on these processes is rooted in our belief in the ongoing importance of the faculty role in student learning and growth in higher education. Some have begun to lobby for other directions. For example, in his advocacy for unbundling higher education, Paul LeBlanc, president of the University of Southern New Hampshire, has argued that the “vertical integration” of the core functions of education in the body of the faculty is a legacy of the past that must and will be discarded. He points enthusiastically to the “disaggregation” of these functions, for the separation of instruction, content expertise, advisement, and assessment into distinct roles to be filled in different ways by technology and by lower-paid and more easily replaceable employees.

LeBlanc writes, “A lot of the new education technology industry now attracting so much venture capital is based on companies harnessing technology to provide some portion of the newly unbundled teaching and learning process” He points to applications and companies such as Coursera, Udacity, OpenStudy, Smarthinking, and Knewton as examples of the use of technology to “fill in some part of a process previously provided by faculty...”² Stepping carefully, he points to radical changes in the higher education workforce as an unavoidable necessity. “New educational delivery models that remove the role of instructional faculty, for example, are an example of this ‘efficiency’ application of technology in education.”³



Faculty must be supported in learning about, adapting to, and taking on crucial new roles, and their institutions must commit the resources and attention required to translate emerging opportunities into meaningful student, faculty, staff, and institutional learning.

In contrast, our contention is that, just as colleges and universities must rethink and rebundle to make college learning more integrative and adaptive, so too must the faculty role be rebundled in the emerging digital learning ecosystem. In fulfilling this rebundled role, faculty can take advantage of the capacities of analytics, adaptive learning systems, e-portfolios, and other tools for making learning visible in order to reconnect with each other, with staff, and with students. Working with instructional design teams, librarians, advisors, and peer mentors, faculty can take advantage of new resources to connect academic learning with mentoring and attention to the whole student. The faculty's role in authentic, digitally supported outcomes assessment is crucial to the continuous design cycles that are needed to make adaptive change. Thoughtful attention to faculty development and outcomes assessment is critical to helping faculty adapt to and fundamentally reshape the faculty role in the emerging educational landscape.

At the same time, we recognize the multiple obstacles to productive faculty engagement in adapting to the digital learning ecosystem. Institutional cultures and structures, particularly the faculty reward system and its emphasis on research over teaching, make it difficult for many faculty, particularly those at research universities, to focus on teaching and learning. The growing reliance on part-time faculty creates highly significant additional barriers. From opposing ends of the economic spectrum, research faculty and part-time adjuncts face structural barriers that limit their ability to focus needed attention on pedagogy and learning design. Faculty development and assessment processes alone are not sufficient. As we will discuss in chapter 6, broader institutional change is also required.

Faculty Learning and Change

The value of all digital strategies ultimately depends on whether they are implemented well. If the current moment offers an exciting chance to expand and take new advantage of human-machine synergies, the human element is fundamental. The dynamic of human-machine synergies must be informed by sophisticated understandings of teaching and learning. Colleges and universities must pay attention to this, supporting faculty development with a commitment of resources equal to, or even greater than, the resources devoted to developing new tools and systems.

While the importance of faculty development is widely acknowledged, the commitment of resources often lags behind. This is true even with regard to the use of digital courseware, the most basic of digital teaching tools. In a recent national survey of faculty conducted by the Tyton Group, “Over 60% of respondents reported that faculty at their institutions are encouraged to use digital courseware. However, far fewer reported being trained (30%) or incentivized (15%) to do so effectively.”⁴

Effective faculty development around digital learning goes beyond technology training to focus attention on pedagogy. Broad attention to deepening pedagogical insight will be crucial to meaningful implementation of almost any type of digital tool or system. In our emerging context, “pedagogy” refers to a vision of how adaptive and integrative learning happens and to a cohesive, informed strategy for advancing that process. Pedagogical insight is also critical to the faculty's ability to contribute to the development of new digital resources and to provide thoughtful guidance to their institutions as they create new, rebundled models for higher learning.

Faculty development can provide time, space, community, and support to help faculty and staff focus on the interplay between pedagogy, new technology tools and resources, and a redesign of the learning process. Creating effective faculty development programs is not always easy, but the challenge must be met. The institutional creativity and commitment needed to engage broad numbers of faculty and staff in sophisticated professional development will be a critical indicator for higher education's ability to adapt to and survive the digital challenge.

Fortunately, a rich body of research and practice has identified the parameters of effective professional development. There are growing numbers of centers for learning and teaching on campuses nationwide, and while many are small and underfunded, some have developed a robust campus presence. The Professional and Organizational Development Network in Higher Education runs lively conferences and listservs and publishes invaluable resources in print and on the web.⁵ From this body of work, we can draw important lessons about what makes professional development effective.

While institutional approaches vary, there are several common characteristics of effective faculty development:

- ***It respects and builds on what faculty know.*** While faculty may not be experts in technology, they bring key expertise to the conversation. “Training” that disregards faculty expertise misunderstands the nature of professional learning, discards crucial knowledge resources, and is unlikely to produce meaningful engagement.
- ***It focuses attention on the connection between teaching and learning, between faculty actions and the actual process of student learning.*** Focusing only on faculty designs and ignoring what students actually do and learn misses a crucial element of the equation.
- ***It is sustained over time.*** Professional learning and change take time. The process of design, implementation, and assessment of impact takes time to unfold. One-shot workshops are minimally, if at all, effective.
- ***It engages faculty with a broader community in rethinking practice.*** This community can go beyond other faculty to include IT staff, advisors, and others. It's crucial to create a supportive environment that values risk-taking and recognizes failures as learning opportunities.
- ***It connects to reward systems.*** If teaching is institutionally valued, engaging in faculty development should be recognized as purposeful engagement in addressing institutional mission. Stipends and reassigned time are valuable signifiers, but the most important step is recognition in the tenure and promotion process.

These characteristics of effective faculty development provide an essential foundation for engaging faculty in rethinking their practice as it relates to digital learning and teaching. They can help faculty consider, explore, and create new ways to take advantage of the digital opportunity in order to strengthen engagement in adaptive inquiry, mentoring, and integration from the inside out. Building faculty experience and expertise in these areas is a crucial prerequisite for reshaping the faculty role and effectively advancing adaptive change in higher education.

Faculty development can provide time, space, community, and support to help faculty and staff focus on the interplay between pedagogy, new technology tools and resources, and a redesign of the learning process.

There are ways that new forms of digital technology can actually spur faculty development. The process of learning how to use new applications puts faculty in the role of learners and can prompt rethinking about long-accepted goals and approaches. Thinking about how to use the adaptive learning systems and other new tools developed by the Open Learning Initiative (OLI), for example, can feed discussions of scaffolded approaches to inquiry and problem solving.

Whatever tools and systems are used, the most effective faculty development designs model for faculty the kinds of practices that can support a rich vision of higher learning.

More broadly, the capacities of digital tools and systems open new ways to offer and deepen powerful professional development. Learning analytics, e-portfolios, and other digital resources can make the processes of integrative learning more visible and, thereby, make it easier to focus professional development not only on teaching, but also on holistic student learning. Carefully designed online exchanges can supplement and extend face-to-face professional development conversations and create opportunities for multi-campus collaboration. Documenting and publishing faculty work on the web through open educational resources, freely available to all users, can advance opportunities for more effectively sharing and for building the collective knowledge and skill that can help colleges and universities use new digital systems to advance liberal education.

The Taking College Teaching Seriously project, a community of practice funded by the Kresge Foundation, has developed an exciting, digitally enhanced faculty development strategy. Working with community college faculty and focused on the challenging task of improving basic skills education in English and mathematics, the project developed a powerful teaching analytics system to be used in online professional development processes. By building analytics-enhanced teaching portfolios, faculty were able to identify the aspects of powerful teaching that work best for them, document and track their use of these practices, and get immediate feedback from their faculty colleagues. Data from this project suggest that it helped faculty refine and strengthen their craft and improve outcomes for high-need students.⁶

Whatever tools and systems are used, the most effective faculty development designs model for faculty the kinds of practices that can support a rich vision of higher learning. If the focus is on encouraging constructivist student authoring with multimedia tools, for example, it is important to create an experiential reference point for discussion and design by engaging faculty in processes that model the authoring process. At LaGuardia Community College and other Connect to Learning campuses, for example, professional development is guided by three design principles that address both faculty and student learning (see table 4.1).

Well developed in the literature on student learning, the powerful principles of inquiry, reflection, and integration can effectively guide professional development processes and enhance both pedagogy and professional learning. These principles support processes that advance teaching and learning and that connect pedagogy and technology. Faculty development related to digital learning must address the need to build the skills required to use new tools and systems. Faculty and staff must gain facility with new applications. But this more mechanistic aspect of professional development is only meaningful when it is directly connected to issues of pedagogy and practice and guided by a rich vision of higher learning.

TABLE 4.1. Inquiry, Reflection, and Integration: Design Principles for Student, Faculty, and Institutional Learning

	STUDENT LEARNING	FACULTY DEVELOPMENT AND REFRAMING OUTCOMES ASSESSMENT
Inquiry	Problem-based or inquiry learning is a cyclical process that involves asking questions about authentic problems, analyzing relevant evidence, creating and presenting evidence-based solutions, reflecting on the learning process, and developing new questions and plans for further inquiry.	Faculty development programs with an emphasis on digitally enhanced inquiry ask faculty and staff to raise questions, explore issues, evaluate new resources, and use their classrooms as laboratories for scholarly experiments with new pedagogies. Outcomes assessment as inquiry focuses on the examination of authentic artifacts of student learning. Framing faculty development and outcomes assessment as inquiry processes highlights their common emphasis on professional learning as an overarching goal.
Reflection	In the emerging digital era, reflection is a crucial lifelong learning skill and an essential process for building integrative and adaptive capacities.	In a faculty development process, reflective activities help participants learn from their experiences and develop as reflective practitioners who are prepared to adapt to and help shape the new digital learning ecosystem. In outcomes assessment, reflection helps faculty connect the data emerging from assessment processes with implications for individual and collective practice.
Integration	For students, integrative learning involves making connections and transferring knowledge across courses, disciplines, and semesters; it also involves linking academic learning with lived experience into a more intentional whole.	In the context of both outcomes assessment and faculty development, integration involves the transfer of knowledge and insight from specific instances to broader contexts and applications. An emphasis on integration leads faculty to think beyond their individual classrooms and to address larger campus structures and cultures, which, in turn, helps build campus strategies and coalitions for change and enables transformative digital learning to thrive.

Assessment, Outcomes, and Learning

For many years, the discussion of outcomes assessment in higher education has been driven by issues of accountability—the need to demonstrate to accreditors, legislators, and other officials that education actually works. This aspect of assessment is perhaps unavoidable. But in the context of the digital opportunity, it is important to think about assessment in a different way, as not simply assessment *of* learning, but more importantly assessment *for* learning—student learning, professional learning, and institutional learning. In the context of the digital opportunity, this type of assessment is paramount.

With common learning goals and measurement tools in hand, digital technologies can support authentic outcomes assessment. E-portfolios offer particularly rich ways to focus assessment on the real work of learning and teaching.

Assessment for learning means assessment that is intended as much or more for internal as for external audiences. It assumes that faculty and even institutions themselves are learners, and that the purpose of assessment is to prompt the ongoing learning needed to guide changes in pedagogy, curricula, and institutional practice. At a moment when adaptive change in higher education is an absolute necessity, there is a critical need for assessment that “closes the loop” and supports recursive design processes across the campus.

Thought of in this way, outcomes assessment often overlaps with professional development. Most often, professional development engages faculty in an inquiry into student learning in their own courses and classrooms. Authentic outcomes assessment, grounded in faculty practice and the artifacts of student learning, not only helps deepen this process by illuminating with greater clarity and rigor what is happening in terms of student learning, but it also extends the scope of faculty inquiry to include what is happening across an entire course sequence, to address learning and teaching in both general education and the major, and even to bridge curricular and cocurricular learning. Inquiry, reflection, and integration can be as powerful as design principles for outcomes assessment as they can be for professional development.⁷

As for professional development, the challenge for outcomes assessment is to shift the focus from teaching to learning—or, more accurately, to understand the relationship between teaching and learning. Addressing this challenge requires careful thought about learning and the kinds of learning that faculty and institutions value and seek to foster. For meaningful outcomes assessment, the next step is considering how progress toward learning goals can be measured. The VALUE rubrics developed by the Association of American Colleges and Universities are a highly effective tool for this purpose.⁸

With common learning goals and measurement tools in hand, digital technologies can support authentic outcomes assessment. For example, by making student learning visible and sharable, e-portfolios offer particularly rich ways to focus assessment on the real work of learning and teaching. Meanwhile, new learning analytics applications offer new finely grained ways to understand student learning behaviors and adapt teaching and mentoring to the needs of individual students.

E-portfolios can be more than just places for students to showcase and reflect on their learning. They can also be places to collect and organize student work for more meaningful and authentic assessment of both general education and

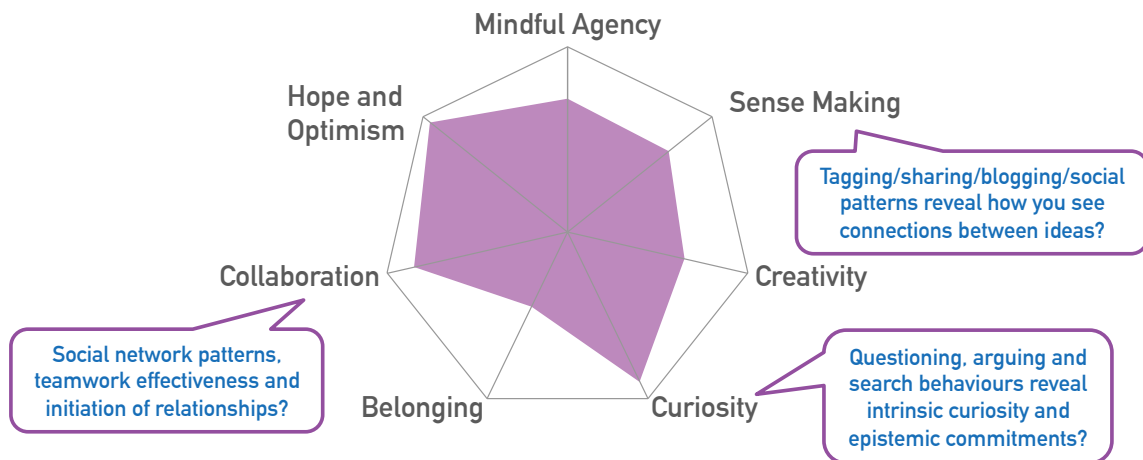
programmatic competencies. Results from standardized national examinations may satisfy demands for accountability, but they often make it difficult for faculty to connect assessment to their own pedagogy and practice. Grounding assessment in authentic artifacts of student work, as assigned by faculty, bridges the gap between assessment and the classroom. After reviewing student work collected through e-portfolios or other digital systems, faculty and staff can make concrete recommendations to improve curricula and pedagogy. This, in turn, makes it easier to “close the loop” and implement changes that improve student learning.

In a moment when students’ ability to connect their learning is increasingly vital, e-portfolios also provide a unique opportunity for faculty to focus on and assess how students integrate their learning across courses, semesters, and disciplines as well as how they connect traditional academic topics with co-curricular learning, life experiences, and high-impact practices such as study abroad, service learning, and undergraduate research. Due to their inherently connective qualities, e-portfolios are ideal vehicles for documenting and reflecting on connected learning across boundaries, making it available for the kind of thoughtful assessment needed to guide the development of more integrative digital learning environments.

New analytic tools may also create additional opportunities for enriching assessment in ways that reflect our emerging understanding of the multiple dimensions of student learning. What role could computational analytics, machine

Analytics for Learning Dispositions

Behavioral analytics for learning dispositions?



Reproduced by permission of Simon Buckingham Shum.

Learner analytics can be used to link the traces that people create in digital environments to broader learning dispositions. This graphic represents learning theorist Simon Buckingham Shum’s speculation on ways that behavioral analytics might illuminate features of a learning model created by Ruth Deakin Crick, including learning dispositions such as sense making, curiosity, and collaboration.⁹

learning, and “big data” play in capturing and making visible the processes of, or meaningful moments in, student learning and development? We strongly urge campuses to identify the “analytics” of an integrative, holistic education and to imagine what analytics systems could do to help them examine the large corpuses of data generated through learning activities, such as reflection on experiences, online discussion forums, and potentially even behavioral data. Learning—and especially “learner-centered”—analytics hold much promise as a mechanism for integrating qualitative and quantitative measures of learning and growth, as well as for visualizing and feeding meaningful data back to stakeholder groups at multiple levels of the educational ecosystem.

The growing field of qualitative, discourse-centric analytics holds much promise for developing analytics of integrative learning. Through organizations like the Society for Learning Analytics and Research and the related Learning Analytics and Knowledge conference and journal, researchers have been exploring how machine learning and computational analytics of many kinds can help us know more about what happens in the learning process, both to individuals and in social learning networks.

According to Simon Buckingham Shum, who has summarized the burgeoning work of the analytics community, learning analytics provide an opportunity to train computers to recognize the kind of moves that we as practitioners know students are making when they are learning, and to make these moves visible in patterned and meaningful ways. Shum points to three key possibilities:¹⁰

1. **Social network analysis** can make visible the social networks, relationships, and interactions present in a traditional discussion forum. Interpersonal engagement and social capital analytics can provide insight to peer-peer and peer-mentor dynamics by making network connections, interactions, and topics more visible.
2. **Dispositional learning analytics** collected from self-reports, informal and formal teacher observation, and behavioral analytics data can provide insight into what learners are doing in online spaces. Behavioral data can also come from apps similar to fitness tracking, which collect information about how people respond when they are placed in challenging learning situations, such as measuring and monitoring stress levels during presentations or other performances of learning.
3. **Narrative and discourse analytics** go beyond the number, size, and frequency of online discussion posts, looking beneath the surface to find and quantify linguistic proxies for “deeper learning.” Natural language processing technologies involve teaching computer software to recognize effective learning through analysis of written and oral discourse in online spaces. Shum and his colleagues have used machine learning to train a computer to recognize the most effective learning conversations in webinar text chats and e-portfolio-based reflections.

Two priorities can shape the use of learning analytics. The first is to empower students by giving them control over their own analytics through student-centric dashboards—a move that could be understood as a shift from learning analytics to “learner analytics.” The second is to elevate evidence of the process of integrative,

deep learning to all levels of curricular design and institutional decision making. Providing robust and multiple sources of learning analytics along the whole arc of learning will help achieve the ultimate goal of informing educational designs to best support transformative learning and growth for all students.

Learning analytics and authentic e-portfolio-based institutional outcomes assessment operate at two different levels—one more finely grained and behavioral, and the other more sweeping and focused on learning artifacts and outcomes. Together, they suggest ways that digital tools can open new windows into student learning. The deepest challenge of both is to find ways to close the loop, to turn these insights into informed, intentional change. This challenge, however, is more about institutions than it is about technology. To effectively take advantage of digital advances, colleges and universities must become learning organizations; the adaptive skills we seek to develop in students must be integrated into our institutional structures and cultures. The challenges related to creating learning organizations, including the development of an integrative analytics, are taken up more fully in the next chapter.

Outcomes assessment and professional development are often thought of as two entirely distinct processes. Bringing them closer together allows educators to use outcomes assessment to inform professional development, to ground it in a shared and systematic examination of student learning. Digital tools and systems can play an important role in deepening such examination. Digitally informed outcomes assessment and digitally focused professional development can together help colleges and universities become more agile learning organizations, adapting to and helping to shape the new learning ecosystem.

New analytic tools may also create additional opportunities for enriching assessment in ways that reflect our emerging understanding of the multiple dimensions of student learning.

CHAPTER 5

Design Principles for a Rebundled Institution

Too often, education technology views students as objects, not as subjects of the educational process. (Of course, schools have a much longer history of doing precisely that.)

—Audrey Watters, “Top Ed-Tech Trends of 2014”

Rebundling: From Pedagogy to Institutional Strategy

The discussion so far has focused primarily on rethinking learning environments at the level of pedagogy. We started with reframing the core elements of liberal education, prioritizing engagement, community and mentorship, and integration as foundational to making use of networked digital tools, learning analytics, and the larger digital ecosystem. Focusing on student learning activities, learning systems, and faculty-student interaction are all fundamental to approaching our original design questions:

- *What could liberal education look like if we were inventing it at this moment in history? What forms of liberal education are only possible now?*
- *How might the new digital context—the whole of the emerging learning ecosystem—help us renew a vision of liberal learning and make it widely available to, and meaningful for, an expanded population of college students?*

Our examination of these questions has shaped our overall approach to what we call “rebundling.” First and foremost, this involves putting disintegrative or disaggregative strategies (modular, analytics-driven designs) in the service of an integrative vision. Doing so requires creating learning designs that blend the best core elements and current practices of liberal education with new models for learning, calibrated to the affordances of the new digital ecosystem. This is especially true when looking for models of “scaling,” where web-based or digital practices (e.g., gaming, online communities) might provide better models for engagement at scale than merely enlarging such face-to-face practices as lecturing. A rebundled approach asks us to rethink “personalization” of learning, which can only be achieved through a thoughtful combination of technological and human intervention. As Michael Feldstein and Phil Hill put it, “Personalized learning is not a product you can buy. It is a strategy that good teachers can implement. Without good teachers and good strategy, even a great product designed for personalized learning applications has limited value and, in the worst case, can actually do more harm than good.”¹

At the root of our approach is a commitment to a certain kind of learning and the cultivation of a certain kind of learner, distinctive to the tradition of liberal



“Rebundling” an institution requires creating learning designs that blend the best core elements and current practices of liberal education with new models for learning, calibrated to the affordances of the new digital ecosystem.

learning and the best principles of American higher education. This commitment holds that educating the whole person, with knowledge, skills, and the larger capacities for a life of purpose, is essential both for professional success and for a life of fulfillment and flourishing. Colleges and universities, at their best, are distinctive as institutions that can produce this kind of learning.

Taking advantage of the digital opportunity asks us to employ digital environments to help institutions be their “best selves” in this tradition. With this in mind, it is critical to take these principles and strategies up to the institutional level (and beyond) to start scoping what we might think of as rebundled institutions. To do this implies a “systems approach,” in that the best way to plan the use of digital technologies is not in isolation but through broad strategies that advance the core features of liberal education and focus all key stakeholders in the institution (or system) on learning. And it also implies adopting a fundamentally “open” stance, because what is needed is not a set of fixed enterprise-wide solutions, but rather a more agile collection of strategies driven by a coherent vision, allowing for creative use and development within the institution, and in some cases connecting communities in the institution to the broader web.

What is at stake is a different kind of digital learning system, one that at once empowers the learner, changes the ways that the different parts of the institution integrate with each other, and shifts the ways that the learner engages with the larger ecosystem.

A rebundled approach captures critical emergent trends in thinking that we believe are integral to understanding the changing position of higher education institutions in the new ecosystem. We can already see a shift taking place in the thinking about institutional learning environments. A 2015 EDUCAUSE report on the “next generation digital learning environment” asserts that a new system cannot merely add to current enterprise (i.e., campus-wide) learning management systems, but instead has to be built around new digital architectures that are designed for learning and “that contribute to and enable the transitions that higher education is currently experiencing.” These changes demand, the report argues, that the new digital environment “must be about learning, since learning ties together learner and instructor,” and “it must be an environment or ecosystem—a dynamic, interconnected, ever-evolving community of learners, instructors, tools, and content.”²

This vision of the next-generation digital environment sees the model of the future “ecosystem” as a kind of “mash-up,” where, like a mash-up web page or application that assembles content from multiple sources into a single resource, the new digital learning environment will have to be one that “uses a heterogeneity of components to produce a homogeneity of function.”³ Some experts, such as Jim Groom, go even further, disputing the need for any kind of coherent learning system and asking questions like, “What is [the] minimum amount of technical infrastructure required to create a rich digital learning environment?” and “Of that minimal amount of infrastructure we need, what is the minimal amount that needs to be owned by the institution rather than the learner?”⁴ George Siemens makes a similar point in advocating for “small single-functionality toolsets that are loosely connected or at least that are connectable. . . . If you want learners to have their own spaces, own their own learning, then you need them to have toolsets that don’t lock them into a system and do absolutely everything.”⁵

What is transpiring here is a technical conversation that echoes the broader conversation about “unbundling” and “rebundling” within higher education. What

is at stake is a different kind of digital learning system, one that at once empowers the learner, changes the ways that the different parts of the institution integrate with each other, and shifts the ways that, through the institution, the learner engages with the larger ecosystem. To reimagine the digital environment as a “heterogeneity of components” that produces a “homogeneity of function” is in many ways to look at rebundling through a technical lens. This suggests that we can rally around a new educational paradigm rooted in a core integrative vision that is not dependent either on an older notion of the educational bundle or on the rigid boundaries of the classroom, curriculum, campus, and institution. Thus, the challenge is not to build the perfect “next-generation” learning environment for the formal curriculum, but instead to array digital tools for the kind of learning subject whom we are trying to develop.

Design Principles for a Rebundled Institution

Our approach advances the vision we laid out in chapter 1, that higher education in the digital age should be *learner-centered*, *networked*, *integrative*, and *adaptive*. These four dimensions form a logic chain, bridging the core elements and purposes of liberal education with the new position of colleges and universities in the larger ecosystem. They serve as categories for design principles that can, in turn, guide how an institution (or a system) responds to the digital opportunity—how the architecture of the digital environment is perceived, how diverse instructional staff (including faculty) are engaged in the redesign of learning experiences, and how students are empowered to “own” their own work and data. This approach also fundamentally values the mix of current successful practices with new and emerging ones.

Each of the four categories can help focus institutional responses:

1. **Learner-centered.** Do your learning environments support engagement in the context of empowerment and the ownership of learning?
2. **Networked.** Do your systems and practices maximize community, inside and outside the institution, and a broad concept of mentorship?
3. **Integrative.** Are your systems and practices serving to maximize connections and coherence?
4. **Adaptive.** Are your systems and practices supporting the critical capacities of institutions for improvement and agile innovation?

Each dimension is at work, to some extent, in every institution. But they are often swamped by legacy structures and practices that serve as barriers to the widespread adoption of innovations that have demonstrated effectiveness. Making the most of new digital affordances, then, will take attention not only to the core elements of liberal education, but also to questions and design principles that flow from the four dimensions and that can guide decisions, investments, and ongoing institutional reflection on the effectiveness of learning environments. (See table 5.1 on page 69 for a sampling of questions that might guide institutional decision making.)

Design Principles for an Open Systems Approach

1. Learner-centered. Focus decisions about digital environments and tools on student empowerment and ownership of their learning.

What does it look like when students are treated (as the epigraph above by Audrey Watters puts it) as *subjects* rather than objects in the new digital ecosystem? Digital learning environments are not merely scaled systems through which students pass; they are empowering environments in which students learn to make meaning, solve problems, and marshal their best work in communities of practice.

We have as human beings a greater opportunity than ever before to narrate, document, and shape our digital lives. It should be a distinctive responsibility of higher education institutions at least to prepare students for this world.

This design principle speaks to the essence of the kind of learning that colleges and universities seek to cultivate. At the core of this principle has to be an institutional commitment to students' ownership of their learning in ways that are responsive to the native capacities of the digital ecosystem to shape identity, find resources, and connect with others. We have as human beings a greater opportunity than ever before to narrate, document, and shape our digital lives. We are also subject to having our data and behavior tracked and our information profiles shaped and manipulated in ways we may not even understand. It should be a distinctive responsibility of higher education institutions at least to prepare students for this world.

This same commitment to critical agency in digital contexts should be extended to institutional environments more broadly. How are students being empowered to curate their learning? Are all students—especially new majority students—being given the full range of tools and capacities they need to thrive in digital environments? Is the collection of student data transparent?

Are students being given the tools to make their learning portable and to make their learning records flexible, so they can be reshaped for different purposes during multiple job and career changes?

From an institutional perspective, learner-centered digital environments imply at least three key priorities. The first is what some call *digital fluency*. As with language, *fluency* is a much higher threshold than *literacy*. "In school," as Beth Holland explains, "we consider a student fluent when they read and speak the language as well as write it. With technology fluency, a student not only navigates within a single environment, but also begins to 'demonstrate an ability to make effective choices and use the tools to advance their understanding and communication.' ... [T]he ultimate sign of technology fluency is the 'ability to manipulate, transform and move information across various media and platforms.'"⁶

There is an intricate and inalienable relationship between attaining digital fluency and being liberally educated in the twenty-first century. Yet in most institutions there is a mismatch between the most common digital environments where students spend their time, on the one hand, and the commitment to developing students as critically capable agents in a networked world, on the other. In a critique of the Learning Management System (LMS), Jim Groom and Brian Lamb frame one salient version of this mismatch:

Domain of One's Own

The Domain of One's Own project is designed to develop digital fluency by providing each student with a domain name and web space, along with a pallet of web design and programming tools. Begun at the University of Mary Washington, the project has spread to Emory University and a growing number of other institutions across the United States.

EMORY UNIVERSITY Domain of One's Own
Emory Writing Program

HOME WRITING PROGRAM WRITING CENTER LOGIN

MY DANCE TEACHER OR ME? EXPRESS FROM THE VOICES MORE

FROM JUMPS TO REGRETS

Radhika Ambazhagan, a freshman in Heather Julien's English 101, wrote this autoethnography on Bharatanatyam, a classical style of Indian dance.

Welcome to Domain of One's Own @ Emory University!

Broadly outlined, this project enables students at all course levels and across the disciplines to author and administer their own websites. Student domains function as hubs for course work, social media, film and video archives, professional portfolio materials, and civic engagement resources.

If you're a student in one of our Domain courses, then throughout the semester your class will be exploring web literacies, new media composing practices, and experiential learning activities that put your domain to use. When the course is over, the space is yours to continue building on. We hope that you'll use it to narrate, define, and archive your learning.

To sign up for your own domain, go [here](#) and login with your Emory netID and password. If you're already part of the program, follow that same link to sign in and get to your cPanel.

If you need assistance with some aspect of managing your domain or publishing your coursework, check out the [Domain documentation pages](#).

Check out the faculty who are teaching in the program this semester to find out more about these classes. Or find out who taught with Domain in its pilot year of 2013-2014.

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A Domain of One's Own

FEATURED SITES

Candice Roland

UMW student Candice Roland is using her site to showcase and share her work as a historic preservation and American studies major.

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Ghost Debates

Posted on March 15, 2016 by Lesya Melnychenko

It figures that the ONE TIME I miss class and have no internet access is the day we do an activity. Oh well. I spent this weekend in NYC for family business and got back to campus at 10:45 Monday morning before heading right to my classes, then was out working with YMCA SACC for ... Continue reading "Ghost Debates"

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POSTED IN INTERNET | TAGS: HONR, HONR100E, MKAYLER, SYNDICATED POST | LEAVE A COMMENT

History Websites

Posted on March 15, 2016 by Megan Joslin

My first website is for the Center for White Rose Studies and on the website there are the actual leaflets that the group distributed. There is also a section in which they provide a brief history of the group and its activities. It has proven to

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ABOUT

Welcome to the University of Mary Washington's Domain of One's Own project. A Domain of One's Own provides domain names and Web space to members of the UMW community, encouraging individuals to explore the creation and development of their digital identities.

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We are currently syndicating **2452** sites from **2029** domains.

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Reproduced by permission of Domain of One's Own @ Emory (top) and University of Mary Washington (bottom).

Perhaps the greatest pedagogic shortcoming of the LMS is that even in an era when it is widely understood that we need to guide our students into an information age of immense complexity, promise, and uncertainty, we force them to spend countless hours on computers in a virtual environment that does nothing to equip them with practical web skills. All they learn is non-transferable dexterity navigating an environment unlike anything they will encounter outside of school. Every hour spent online inside an LMS is one in which students are not engaging the wider web in a spirit of critical inquiry.⁷

The LMS was designed to be responsive to the most traditional pedagogies at the core of higher education institutions.⁸ This is the point. The LMS—and, one could argue, the massive open online course (MOOC) as realized by elite schools—at least initially took the traditional classroom as the metaphor and paradigm for scaling educational technology.

One of the great challenges of redesigning liberal education for the new ecosystem is that our models for scaling engaged learning may need to come, at least in part, from paradigms outside the walls of our institutions. One such example is how individuals are coming to create their own identities and narratives. On the web and in the context of everyday life, individuals use a “heterogeneity” of tools to create and self-create their identities, to document and share their lives, and to seek and make use of information. New majority students are typically the most in need of support in learning how to make use of such tools; the skills and capacities for using the web effectively are distributed very unevenly. This further strengthens the argument for taking the most authentic digital learning environment as the starting point for remaking higher education.

What’s needed is an integration of the empowering potential of open environments that meld, seamlessly and transparently, with the platforms that support the best assessment practices.

A second key priority implied by learner-centered digital environments is student ownership. The importance of students’ ownership of their digital environments is demonstrated by the most successful and effective e-portfolio initiatives. Although individual faculty and programs might be very intentional about implementation, e-portfolios themselves are seen as “student owned” spaces for reflection and representation. One emerging example across a range of institutions is interest in a “Domain of One’s Own,” which calls for giving all students their own web domain space and the institutional support they need to make personalized use of it (see page 55). Begun at University of Mary Washington, and now spreading to a growing range of institutions, the philosophy behind Domains is that the heart of digital fluency is ownership, agency, empowerment, and creativity. One way to address students’ relationship with digital fluency is to restructure students’ relationship to their data. This is behind early thinking around the Personal API, which takes the concept of the API (or application program interface), by which software applications connect to digital platforms, and analogizes it to the ways that individuals can authorize the use of their personal information by institutional platforms. Schools such as Brigham Young University are experimenting with giving students more control over their data. Domains, the Personal API, and related efforts are all emergent examples of how learner-centered technologies could be fundamentally reimaged within broader digital strategies at the institutional level.

As with many aspects of our argument for higher education in the digital age, the priority of student ownership raises an unresolved tension. In this case, the tension is between the openness of an environment that advances student expression and creativity, on the one hand, and, on the other, the adoption of a less flexible common platform that supports evidence gathering, assessment, and institutional learning. What's needed, eventually, is an integration of the empowering potential of open environments that meld, seamlessly and transparently, with the platforms that support the best assessment practices.

Learner-centered digital tools must respect the sovereignty of student identity, of data related to a student's own learning, and of intellectual work itself (representing knowledge, skills, and abilities) as well as the relationships among all three. In line with the traditional empowering aims of liberal education, this is a logical expansion of what it means to treat students as *subjects* in a digital world. Their learning is not merely the output of highly structured systems, but something rich, varied, and complex that emerges through the interaction of teaching, learning, and new environments. Digital systems (environments, tools, resources) must be chosen to support all that is central to full educational development.

2. Networked. Focus the implementation of digital tools, platforms, and resources on augmenting connections, inside and outside the institution.

The first design principle focuses on the distinctive kind of learning that we seek to cultivate, respecting students as subjects in control of their own learning; the second principle focuses on respecting colleges and universities as distinctively diverse networked communities that have both internal coherence and complex vital relationships with networks outside their boundaries. “*Connecting* is a powerful metaphor,” says Diane Oblinger.⁹ “Information technology is about connections, which are fundamental to our institutions, our faculty, and our students. Information technology forms a vital neural network—it isn't plumbing. If we can shift the metaphor we use for information technology—the way information technology is seen and understood—perhaps we can realize more of the potential that resides in the best uses of information technology.”¹⁰

Too many educational technologies in the past few decades have served to atomize and compartmentalize the learning process and its various stakeholders. Of course, learning ultimately occurs within the individual, but as we have discussed, knowledge creation and the making of meaning are fundamentally social acts. And the sociality of learning has grown in conjunction with the explosive network capacities of the entire ecosystem in which we live. Therefore, institutional implementations of digital technologies must be driven by the values of the contemporary networked ecosystem as applied to institutional technology strategies:

- social learning at the core
- open and shareable resources
- instructional communities that span boundaries inside the institution
- porous boundaries to communities and resources beyond the institution

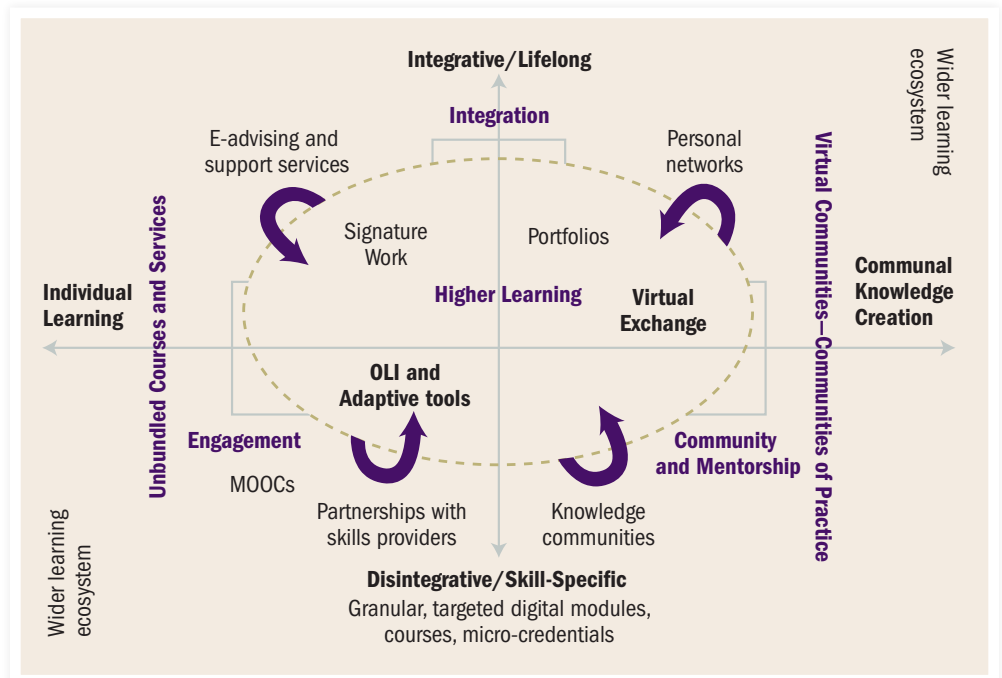
These features add up to tools, policies, and practices that make it as easy as possible for learning at every level to reach beyond the classroom and campus. Students, faculty, staff, and alumni all constitute interlocking communities that

Students, faculty, staff, and alumni all constitute interlocking communities that should be engaged with each other and with external audiences and communities of practice. This is what it means to think of the digital opportunity as “connection” instead of as “plumbing.”

should be engaged with each other and with external audiences and communities of practice. This is what it means to think of the digital opportunity as “connection” instead of as “plumbing.” We might think of this dimension of the principle as *networked* fluency, which, like digital fluency, is crucial to the value of institutional higher education.

It might be useful at this point to visualize schematically the place of higher education in the larger digital ecosystem and to place some of the digital strategies we have been discussing back into the larger context. In figure 5.1 below, the three core elements of liberal education—engagement, community and mentorship, and integration—reinforce each other, framing the distinctive space of the kind of liberal education we have been discussing.

FIGURE 5.1 A View of the Digital Ecosystem



Fundamental to this vision going forward will be the principle that higher education and liberal learning do not stand in isolated contrast to the rest of the ecosystem but, rather, in fluid relation to it. This is a crucial shift from discourse that has pitted the unbundled world against the legacy institutions and has seen them as largely separate spheres. This new relational paradigm calls for greater attention to coherence within institutions; it also requires strategies and practices that position institutions in creative interdependence with other institutions and external partners.

The capacity of universities and colleges to focus resources on high-impact practices, Signature Work, and integrative educational experiences may increasingly depend on how certain practices characteristic of the new ecosystem (such as analytics-driven and/or modular learning) are adopted in the service of higher-order learning. For example, Open Learning Initiative materials, which share all the same features as other intelligent tutors and adaptive learning environments, can be deployed in a supportive context of project-based work and increasingly sophisticated ability to work on complex problems.

Situating liberal education within a truly networked institution will likely mean recognizing the increasingly porous institutional boundaries. The implications of this porosity can apply at least three levels.

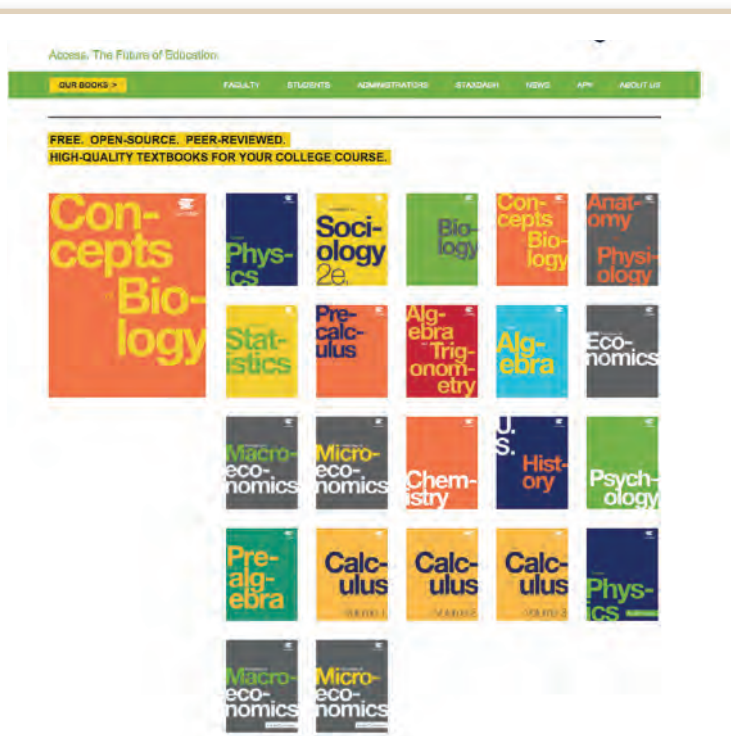
First, there are pedagogical implications, from the facilitation and promotion of connections between courses and communities of practice outside the university to the kinds of inquiry practices discussed in chapter 3 that build on crowd-sourced science and other virtual communities. Learning to communicate, build knowledge, and critique arguments in civil and productive ways are all crucial to digital fluency; institutionally enabled digital environments should support these teaching and learning strategies by making interaction with communities beyond the college or university not only possible but desirable and typical.

Initiatives that value “open” resources and practices have been growing throughout higher education for many years, especially around open educational resources. There have also been several related efforts in recent years around open and connected pedagogies. The so-called “cMOOCs” developed along “connectivist” principles that preceded the “xMOOCs” of Stanford, Harvard, and MIT emphasize the core design principles of autonomy of the learner, interactivity, diversity in terms of tools used, and openness in terms of access, content, activities, and assessment.¹¹ Such environments emphasize creativity and social learning, in addition to building specific skills and different orders of knowledge.¹² The same is true of the “Connected Courses” project (discussed in chapter 3), where disciplinary and interdisciplinary knowledge is taught

Situating liberal education within a truly networked institution will likely mean recognizing the increasingly porous institutional boundaries.

Open Resources

Open Educational Resources (OER) offer freely adaptable and openly licensed digital materials to students and faculty. The OpenStax website (shown here) is a leading OER site, offering college-level textbooks free for download. Using new digital capacities to advance communal peer review, enhance adaptability of content, and drive down student costs, OpenStax seeks to help OER play an increasingly valuable role in a rebundling strategy.



Reproduced by permission of OpenStax College, Rice University.

with an open pedagogy that privileges connecting students with each other and communities and resources beyond the classroom and campus.

Second, in addition to what might be facilitated in courses and learning environments, the porous nature of institutional boundaries will inevitably lead to greater collaboration among colleges and universities, and the increased sharing of curricula, resources, and data on student learning will serve to improve learning designs and the learning sciences. Many state systems, such as those participating in the LEAP States initiative of the Association of American Colleges and Universities,¹³ are pioneering strategies for aligning curricula, removing obstacles to student transfer, and sharing innovations. Similarly, new collaborations among institutions are developing all the time. Unizin, a consortium of “Big Ten” and other institutions, was founded to empower universities in the sphere of educational technology innovation.¹⁴ The University Innovation Alliance (UIA) brings together eleven large public universities to share strategies that will increase graduation rates.¹⁵ One of the key features of the memorandum of understanding signed by the UIA institutions was that they would share not only their data and promising practices, but also their “failures,” as they believed this kind of openness was critical to the capacity to innovate in sufficiently rapid and thoughtful ways. As institutions re-center themselves on high-impact learning, institutional leaders will have to make choices about resources that will only be possible if they let go of older notions of institutional competitiveness and self-sufficiency. Collaboration should not be perceived as a sign of weakness or mere necessity, but rather as part of the network paradigm in which universities are deeply enmeshed in so many ways.

Third, the relationship between institutionally based higher education and the granular, targeted, unbundled services that exist outside of it are likely to become increasingly interdependent. This was the exploratory premise of the 2015 launching of an experimental program from the US Department of Education on “Educational Quality through Innovation Partnerships” (EQUIP). EQUIP is a pilot program to “accelerate and evaluate innovation through partnerships between colleges and universities and non-traditional providers of education . . . including intensive ‘bootcamp’-style training, personalized online programs, MOOCs, short-term certificate programs and others.”¹⁶ In valuing such partnerships, the Department of Education is acknowledging a potential symbiosis between traditional higher education, which has a legacy of practices around the quality of learning, and new providers, who might be able to offer a broader range of students targeted skills in ways beyond the resources of traditional institutions. How well the partnerships will work is unclear, and whether they can avoid some of the pitfalls of “predatory for-profit education” that has emerged in the past remains to be seen.¹⁷ There is, nonetheless, potential for a new dimension of rebundling to create partnerships that will both serve the broadened population of students well and enable traditional institutions to focus resources on their distinctive strengths, such as faculty-student interaction, mentored experience, and the building up of high-impact practices. As long as these more granular, unbundled services are understood, developed, and oriented toward advancing an integrative vision of learning, then new forms of partnerships with other institutions and other kinds of players and providers will likely be essential to making liberal education widely accessible and meaningful.

3. Integrative. Focus on the intentionality and coherence that make colleges and universities distinctive kinds of learning environments. If colleges and universities are distinctively diverse networked environments, then with new digital systems we have the opportunity to make them more integrated than ever before. As we have argued, valuing integration is especially important in a world that is being reshaped by modular and unbundled learning opportunities. Institutional investment in educational improvement should be directed toward harnessing the potential of modular and analytics-driven learning designs, but in the service of an integrative vision. The difficult work of incorporating so-called “personalized learning” into mainstream curricula has taught us a valuable lesson. Those tools that are optimized for adaptive learning, immediate and targeted feedback, and tracking data related to student achievement are effective only when they are integrated into fully supportive contexts that include peer support and other supplemental instruction, as well as support for faculty to redesign instruction to complement and make full use of adaptive tools.

Achieving meaningful effects from digital tools, personalized learning strategies, or high-impact learning practices depends on connecting core institutional services and practices that have typically been disconnected. That is, true integration requires stronger connections among academic affairs and student affairs, academic advisement, internship placement and career services, curricula and cocurricula, and learning design, analytics, and assessment. This goal would be more readily achievable if institutions were retooled to empower students with digital fluency and to operate as open-network environments.

One set of strategies for enacting integration as a design principle focuses on the creation of connected communities around the use of data mining, analytics, and recommendation engines. Rio Salado College, Purdue University, and University of Maryland Baltimore County, for example, have pioneered the use of data-driven recommendation engines and predictive analytics both to identify students with issues around course performance and intervene early before students fail or withdraw, and to guide students toward courses and course sequences that are best aligned with their preparation and performance. At Austin Peay State University, a course recommendation system called Degree Compass uses data mining and analytics to predict course performance for individual students and to help ensure their placements are appropriate, based on data on past performance—theirs and that of all other students (see page 62).

Such uses of data mining, analytics, and recommendation engines have been proven effective, but they also have raised the concern that they may be overly deterministic or that they may simply cater to self-fulfilling prophecies. In moving forward, it is crucial that the power of analytics—especially predictive analytics—not be understood in isolation, as mere algorithms or as algorithms used to inform discussion between advisees and advisors. This is the key to the success of integrated advising systems (called IPASS systems) discussed in chapter 3. Successful implementations, such as that at Georgia State University, demonstrate that the technology that enables integration must be embedded in a broader network of information and support that is qualitative as well as quantitative and that is accompanied by key institutional changes that are supported by key stakeholders from academic affairs, student affairs, and other processes that support student learning.

Achieving meaningful effects from digital tools, personalized learning strategies, or high-impact learning practices depends on connecting core institutional services and practices that have typically been disconnected.

A second strategy for enacting the principle of integration is to make institutional investments in resources that make visible the invisible patterns of data, relationships, and expertise latent in networks that already exist. Much of the data produced by actors moving through institutional digital environments—students moving through the curriculum, faculty designing and posting syllabi, alumni following various pathways in the years following graduation—has been inert, disconnected, and invisible. Much of the digital opportunity lies in bringing those data to the surface and then integrating them into daily practice.

One of the potential growth paths for integrative analytics involves the use of student-curated dashboards and other representations of student progress.

The real power of this will not be in the data alone, but in the reintroduction of those data back into the culture as a way to engage the whole community. Oberlin College's ObieMAPS project, which was created to map campus expertise in culture and languages (across the curriculum and cocurriculum as well as among faculty and staff), offers a local example of an implementation of network technologies that makes visible what is typically invisible. Students can use ObieMAPS to locate resources related to languages and cultures anywhere on campus, whether curricular or cocurricular, or in people, whether faculty or staff. Imagine how a student coming back from studying abroad in Croatia would benefit from connecting with people at the university who speak and are knowledgeable about Croatia. This could include someone who works in the library or in facilities. Making such connections and

Austin Peay State University's Degree Compass Tool

Degree Compass

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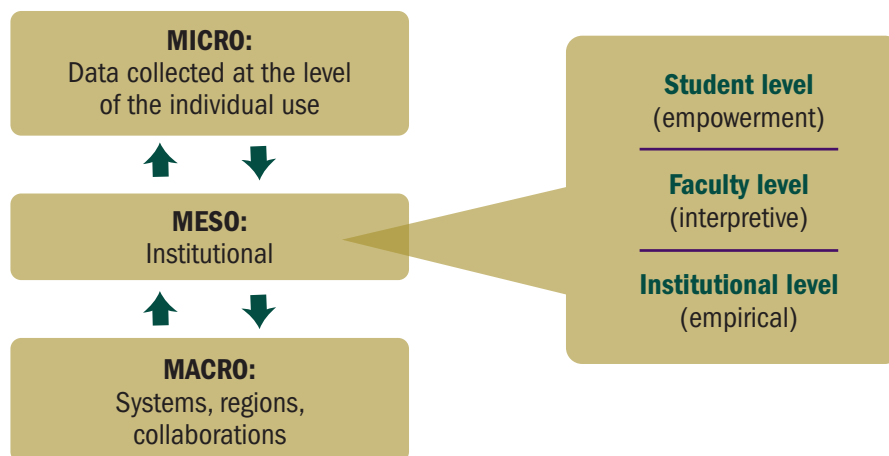
A course-recommendation and degree-tracking engine, Austin Peay State University's Degree Compass is designed to help students make more intentional choices. Degree Compass draws from the student's own enrollment and performance history as well as from predictive models based on the histories of thousands of other students. Used with caution to avoid student tracking, such tools have the potential to empower students by allowing them to see their options in ways that are both expansive and realistic.

resources visible and accessible helps to fully realize the distinctive value of colleges and universities as diverse communities.

A third strategy involves integrative learning analytics, which offers another opportunity to take what could be granular or compartmentalized implementations and put them in the service of integration by marshaling data to develop a more finely grained portrait of the whole learner. One of the potential growth paths for integrative analytics involves the use of student-curated dashboards and other representations of student progress. These representations, however, must go beyond earlier versions that were tied to learning management systems and that emphasized learning data related only to “activity” or “engagement.” Moreover, they must not be mere platforms on which students display digital badges and other credentials. Such early approaches to the use of integrative analytics barely scratched the surface of what student-curated, data-informed spaces could look like.

This potential is expressed by the concept of the Personal Learning Graph developed by George Siemens. A Personal Learning Graph would show students the progress they are making toward knowledge attainment in a given domain and allow them to choose which data to share, combine, curate, and interpret. As Siemens puts it, “Many of the personalized learning systems now available begin with an articulation of the knowledge space—i.e., what the learner needs to know. What the learner knows is somewhat peripheral and is only a focal point

A Three-Tier Model for Learning Analytics



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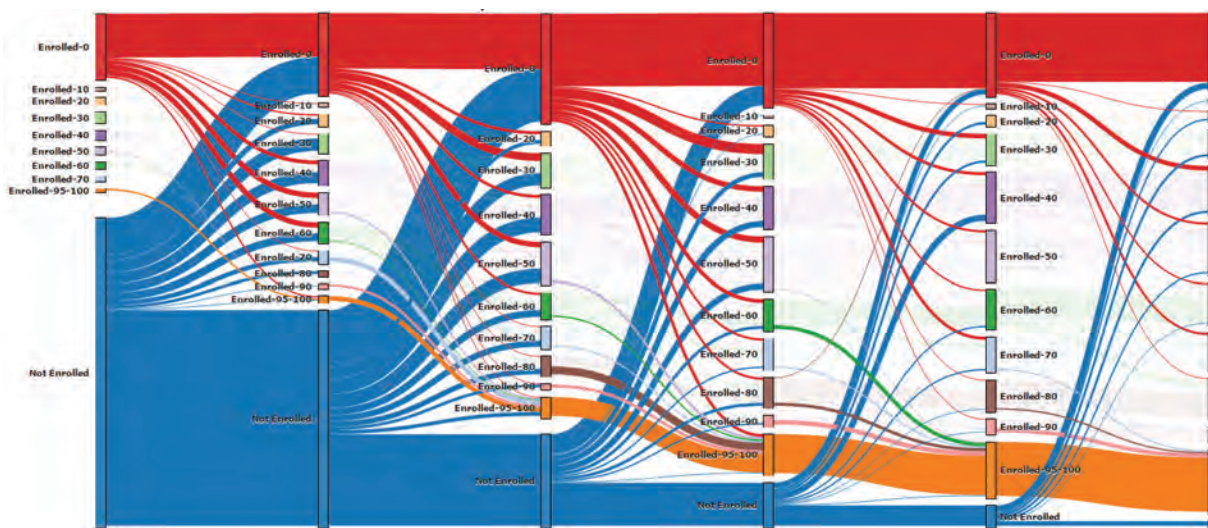
As depicted above, frameworks for learning analytics often employ a three-level model: (1) the *micro* level, or that of the individual student; (2) the *meso* level, or that of the institution; and (3) the *macro* level, or that of the system. A critical elaboration of this model, proposed by Ruth Deakin Crick, sees three different levels or layers of use for learning analytics within the institutional level: (1) use of data by students for their own empowerment; (2) use of data by faculty and designers for their ability to interpret the evidence of student learning on design; and (3) the use of data by institutions to understand curricular effectiveness.

after the learner has started interacting with content... Learners should own the representation of what they know.”¹⁸

The Personal Learning Graph is just one of many ideas and endeavors at play across the country to represent student learning and progress in meaningful ways. The key to these, as with all of our principles, is holding a vision of the whole student at the center (i.e., analytics should not merely represent narrow metrics) and believing in the truly *integrative* quality of the evidence of learning. Ultimately, we have the potential for a new kind of holistic advising and the ability to create an integrative portrait of the whole learner, combining Signature Work (portfolios), learner analytics, and situated assessment from peers and mentors—all set in the context of community-generated pathways, aligned with careers and life-narratives.

4. Adaptive. Focus on the potential to use digital tools to adopt a more agile stance toward learning and design cycles, continuous improvement efforts, and the goal of making institutions into learning organizations. Ultimately, the institutional emphases we have been discussing—empowered learners, networked communities, and more integrative organizations—will only have a sustainable and transformative impact if they are embedded in contexts with continuous design, inquiry, reflection, and development. Neither a coherent vision of the re-centered curriculum nor an open approach to digital tools arrayed around the empowered individual learner is likely to sustain real transformation without significant design and investment in the processes of institutional learning. By institutional learning,

Visualizing Student Performance and Student Pathways



Reproduced by permission of the UC Davis Center for Educational Effectiveness.

Visualizations like this Ribbon Tool, developed by the Tools for Evidence-based Action initiative (see tea.ucdavis.edu), can empower faculty by allowing them to visualize their students' learning performance and pathways through the system. The Ribbon Tool is an example of the use of learning analytics to enable faculty to better understand the impact of their learning designs, which could be particularly valuable in improving courses that are bottlenecks to student success, such as large-enrollment lower-division courses.

we mean any processes where the evidence of learning—both quantitative or qualitative evidence—are accessed, discussed, and acted upon by key stakeholders for the purpose of ongoing improvement of teaching and learning environments. In keeping with our rebundling approach, this effort to “close the loop” on evidence of learning must be taken up at multiple levels, with linkages between and among the levels.

Colleges and universities are innovating and changing all the time—despite accusations to the contrary. It is nonetheless true that institutions are not terribly good at spreading proven changes and scaling them. As Phil Hill has noted, many, if not most, digital innovations get stuck in what he calls “pilot purgatory,” rarely achieving broad implementation.¹⁹ One of several reasons for this has to do with the complexity of the systems that colleges and universities represent. Larry Cuban, a longtime analyst of school reform and a critic of overhyped uses of technology, points out that too many reform solutions—and this definitely includes educational technology—approach institutional change as if it were merely complicated and not complex. What are the implications of knowing the difference? As Cuban puts it, “At the minimum, know that working in a complex system means adapting to changes, dealing with conflicts, and constant learning. These are natural, not aberrations. Know further that reform designs borrowed from complicated systems and imposed from the top in complex systems will hardly make a dent in the daily work of those whose job is [to] convert policy into action.”²⁰

This fourth design principle focuses on the ways that networks and data can help schools function as learning organizations. Digital technology and data analytics cannot accomplish this alone. For a college to become a learning organization takes will and vision from every layer of institutional leadership. The research on learning organizations in for-profit business settings is well developed; interestingly, the comparable literature on “learning colleges” is far less rich. In an article published in *Harvard Business Review*, David Garvin, a leading scholar in the field of learning organizations in business settings, offers the following definition: “A learning organization is an organization skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights.”²¹ Garvin argues that learning organizations are skilled at five overarching activities: (1) problem solving, (2) experimentation with new approaches, (3) learning from their own experience and past history, (4) learning from the experiences and best practices of other organizations, and (5) transferring knowledge quickly and efficiently throughout its various divisions.

Emerging digital tools and systems, defined by their capacities for networking, algorithmic analysis, and distributed knowledge production, are ideally suited to each of these crucial activities. Accordingly, they can play an important role in supporting efforts to make colleges and universities into more agile and responsive organizations. One way to deal more effectively with complexity and to support institutional learning lies in the thoughtful use of “learner analytics.” We have talked already about at least two different kinds of learner analytics: those linked to activity or participation, and those that tell us something about understanding, whether in adaptive programs or through reflection and writing. One of the most common uses of learner analytics ties them to learning management systems in

Emerging digital tools and systems, defined by their capacities for networking, algorithmic analysis, and distributed knowledge production, can play an important role in supporting efforts to make colleges more agile and responsive organizations.

order to help students and advisors track learner activity, mostly for the purpose of identifying warning signs of at-risk learning behavior. Faculty can use analytics to document and examine their own practice and correlate it with student outcomes. But the key to an adaptive learning organization is making use of learner analytics that reveal data and patterns related to students' pathways through the system.

At the institutional level, analytics can spotlight overarching trends in enrollment and completion, providing more nuanced and up-to-date information that can be used to guide decision making and resource allocation. Guided by analytics that track success and failure across courses, institutional decision makers can consider whether cross-campus professional development may be needed to target specific pinch points in curricula or pedagogical practices. Effective innovation at Georgia State, for example, drew on an extensive and supple analytics system that linked institutional analytics with fine-grained but comprehensive learning analytics, used to support an agile and adaptive organizational learning cycle. "GSU has been uniquely effective in using its student-data warehouse to identify soluble barriers to student progression and attacking them systematically," argues one research study. Used by a university that was restructured to emphasize integration, these data supported "the development of a deliberate cycle of piloting innovative responses to identified barriers, testing their efficacy, and rapidly scaling them up if there is evidence of effectiveness. Repeated, successful implementation of this problem-solving process to address the 'low-hanging' fruit has both yielded impressive aggregate improvement in GSU student outcomes and given GSU's administration and faculty the confidence to tackle bigger and less tractable problems."²²

System-Wide Analytics and Student Success

These system-wide analytics developed by the California State System help faculty and administrators track efforts to increase the graduation rate to 60 percent by 2025. Analytics can be used to track indicators of quality, such as student persistence and graduation, across a college or university system, which enables campuses to focus on at-risk populations.



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Well-conceived real-time data can help faculty, staff, and other institutional leaders collaborate in implementing, documenting, and evaluating changes in how the work of the college or university is done. The most effective learner analytics builds upon data used at the individual course and programmatic levels, made available and usable for three key tiers of stakeholders: students (where the focus is on empowerment), faculty (where the focus is on interpretation for improvement), and institutional leaders (where the focus is on empirical questions of impact).²³ A three-tiered, multistakeholder model for integrating the use of learner analytics into decisions about curricula and resource allocations is vital for achieving an adaptive learning organization and will help keep data-driven technologies connected to larger goals around learning, empowering students and faculty, and developing in ways that are at once useful, inclusive, and ethical.

Questions about the ways data are used are paramount. As Garvin and others point out, the hardest step for any learning organization is developing the structures, systems, and cultures that support acting on newly generated insights, “becoming adept at translating new knowledge into new ways of behaving” on an organizational level.²⁴ Here, the strategies of professional development and authentic learning-focused outcomes assessment discussed earlier become critical tools in translating knowledge into new ways of behaving. The institutional decision to make ongoing investments in developing and sustaining outcomes assessment and to link it to professional development will be crucial for shaping the effectiveness of any institutional analytics program.

In our discussion of professional development (“Faculty Learning and Change”), we identified a sequence of three actions—*Inquiry*, *Reflection*, and *Integration* (IRI)—that can be applied to faculty development and explorations of the relationship between teaching, learning designs, and the evidence of student learning. This sequence of activity can be applied at all three tiers of the model discussed above. The IRI model emerged from work on electronic portfolios in the context of the Connect to Learning project, with the realization that e-portfolios can have an impact at multiple institutional levels. That is, they can be used to promote student success and to make learning visible to *students* in empowering ways. After looking at e-portfolios as evidence of the fullness of student learning, *faculty*—alone and, especially, with colleagues—are able to see their programs and the curriculum in new ways, which, in turn, enables them to reinterpret their own practices. Finally, when e-portfolios are used for outcomes assessment at the level of the institution, *institutional leaders* can take a broad look across the full range of programs, whether in general education or across majors, and gain insight about the educational content of the institution as a whole. At each of these levels, however, learning only takes place as a result of a process that includes inquiry into the evidence of learning, reflection on its meaning, and integration back into practice.

Digital resources can facilitate inquiry, reflection, and integration at every level—whether the capacity of networks to make the Signature Work of students shareable across the institution (and beyond) or data that arises from student performance in adaptive systems. Digital resources and new digital learning



The key is moving from inquiry to reflection and integration—that is, from the generation and analysis of data to the thoughtful consideration of implications and the intentional design and implementation of change.

environments can also provide context for sharing assessment data (e.g., rubric scores on student work in the context of key institutional outcomes). They can also provide means to integrate and reflect on institutional research data—data that will only get richer and more complex as “data warehouses” more fully represent the student experience by harvesting data from academic performance, cocurricular activity, and even learning pathways beyond graduation.

The key is moving from inquiry to reflection and integration—that is, from the generation and analysis of data to the thoughtful consideration of implications and the intentional design and implementation of change. And the foundation of that movement is a fundamental commitment to the respective roles of students, faculty, instructional and student support staff, and administrators all having an important shaping voice in the way that evidence of learning gets used in continuous improvement. Creating institution-wide cultures in which these processes are valued and practiced in inclusive ways requires visionary and effective leadership. Mindful planning, design, and iterative innovation will be critical to the growth of adaptive learning institutions that are capable of transforming the digital revolution into a digital opportunity.

TABLE 5.1. Toward Rebundling: Questions for Institutional Decision Making

DESIGN PRINCIPLES	QUESTIONS FOR INSTITUTIONAL DECISION MAKING
<p>Learner-centered: focus decisions about digital environments and tools that enhance student empowerment and ownership of their learning.</p>	<p>Do your learning environments support student engagement, empowerment and ownership of learning?</p> <ul style="list-style-type: none"> ■ <i>Are they increasing their digital fluency as they are learning critical knowledge and skills?</i> ■ <i>Are the skills and tools students are developing and learning to use directly applicable to life outside the institution?</i> ■ <i>Are digital environments providing students with the space required to make meaning and connections and to forge a sense of identity?</i> ■ <i>Is there adequate transparency with regard to the student data being collected? Does the institution empower students to access, interpret, and act on data related to their learning?</i>
<p>Networked: focus the implementation of digital tools, platforms and resources on augmenting community, inside and outside the institution.</p>	<p>Do your systems and practices maximize community, inside and outside the institution, and a broad concept of mentorship?</p> <ul style="list-style-type: none"> ■ <i>Do digital systems support social pedagogies and learning?</i> ■ <i>Are digital environments set up so as to lower barriers to engaging students with communities of practice outside the institution?</i> ■ <i>Are investments being made in mapping resources for students so that the full range of expertise, materials, and opportunities is visible?</i>
<p>Integrative: focus on the intentionality and coherence that make colleges and universities distinctive kinds of learning environments.</p>	<p>Do your systems and practices maximize connection and coherence?</p> <ul style="list-style-type: none"> ■ <i>Do digital systems foster closer connections among academic affairs, student affairs, advisement, internship placement, and career services?</i> ■ <i>What kinds of data and data-related processes would facilitate the creation of a more integrated institution?</i> ■ <i>Is a truly integrated environment being created, supporting greater faculty collaboration in design efforts related to teaching and learning?</i>
<p>Adaptive: focus on the potential to use digital tools to adopt a more agile stance toward learning and design cycles, continuous improvement efforts, and the goal of making institutions into learning organizations.</p>	<p>Are your systems and practices supporting the critical capacities of institutions for improvement and agile innovation?</p> <ul style="list-style-type: none"> ■ <i>Are investments in technologies that track student learning matched by investments in ways for stakeholders to share and interpret data?</i> ■ <i>What kinds of data on student progress and pathways are shared with faculty and at the programmatic level?</i> ■ <i>Is there close articulation between outcomes assessment and learning analytics efforts on campus? Are faculty helping drive their integration?</i> ■ <i>Is there a campus culture of examining and acting on data? What steps could be taken to help faculty, staff, and administrative leaders begin to practice making change, based on the implications of new knowledge?</i>

CHAPTER 6

Coda: The Emerging Opportunity

Even in an essay of this length, we can only just begin to address the questions with which we began:

- *What could liberal education look like if we were inventing it at this moment in history? What forms of liberal education are only possible now?*
- *How might the new digital context—the whole of the emerging learning ecosystem—help us renew a vision of liberal learning and make it widely available to, and meaningful for, an expanded population of college students?*

Exploring these questions has taken us to the core purposes of higher education, reinterpreted through a new learning paradigm—one that is open, connected, and fundamentally social. It is an emergent paradigm that offers the potential for students to become agents of their own learning in ways that we could only have imagined thirty years ago. It is a paradigm that likewise offers the opportunity to envision institutions in a new intermediary position, supporting and linking individuals who want to learn with a vast and rapidly changing ecosystem of educational opportunities. And it is a paradigm that offers higher education an opportunity to transform itself in order to become both more inclusive and more integrated.

The key word here is *emergent*: no one really knows where this new synthesis will lead. It is far too early in the exploration of the potential of networks and algorithms and virtual tools that collapse time and space to know how they may change the face of higher education. Many of the new start-up innovations that grab headlines will look like quaint, if not primitive, experiments in a few years. Many of the new strategies that pass as innovative or even radical within established institutions will look tame and inevitable in one or two decades (and some will look like trendy or bad ideas). But we deeply believe that unless we are guided by the core purposes of the liberal education tradition, the best research on durable learning, and thoughtful principles of agile design, we will have neither compass nor ballast to navigate these changes.

Similarly, in positing an open and integrative approach, we have tried to emphasize the importance of meeting this emergent paradigm with the same complexity that characterizes higher education institutions and the nature of learning itself. In many ways, our four-part vision of liberal education is intended to sketch out a balanced strategy in sync with that complexity: being *learner-centered* allows us to focus on the empowerment of individuals; focusing on *networks* urges us to think beyond individuals to communities and multiplicities of relationships that are not fully legible or achievable without digital tools; focusing on the *integrative* compels us to maximize the distinctive value of higher education by striving to create connections and coherent experiences that are greater than the sum of their parts; and focusing on building *adaptive* organizations impels us to create structures, policies, and incentives that are built for continuous intentional change.



We know that the future of higher education cannot look like its past. In large part, that is because the expanded population of students have already changed higher education.

In laying out this approach, we have largely focused on students, faculty, staff, and institutions. But there are many inevitable possibilities, to which we have only gestured above, for the implications for state systems and other kinds of inter-institutional collaborations. There is much more to explore in this regard. It may be that, in twenty or thirty years, an institution-centered approach to higher education will be one of those quaint or limiting qualities of an earlier era. Nonetheless, the institution is the context in which most of us live, and so it is the unit of analysis we have used to focus our argument.

Unless we are guided by the core purposes of the liberal education tradition, we will have neither compass nor ballast to navigate these changes.

At the same time, we recognize that there are many forces that lay outside institutions—especially public colleges and universities—and that significantly shape what is possible and perilous in designing for the digital ecosystem. These forces include the drastic reduction of state funding for public education, the profound shift from seeing education as a public good to seeing it as a private good, and the uneven understanding among stakeholders of what it means to serve a broader access agenda in ways that empower new majority students for both personal and professional success.

Similarly, we recognize that an unaddressed factor in this story is the changing nature of the professoriate, the decline of tenure, and the rise of a contingent workforce. These funding and labor issues interact in profound ways with the paradigm and strategies we have laid out. We are neither naive about these issues nor insensible to their importance. What we have tried to suggest here is an approach to the digital opportunity that lays down a solid foundation for an expanded, not diminished, role for faculty and for the dignity of the instructional community in a digitally transformed educational future.

Nevertheless, we know that the future of higher education cannot look like its past. In large part, that is because the expanded population of students has already changed higher education. Whether higher education responds to the digital opportunity in the ways we have suggested or in other ways, the beneficiaries of the changes have to include the new majority students who are filling colleges and universities today. If instead we watch passively or resist blindly as the unbundling of higher education happens around us, we risk lowering our society's expectations for how we serve *their* needs, consequently ill-serving them and our society.

Even as higher education is always changing and innovating, it must change fast enough to keep up with the larger ecosystem and provide visionary leadership, not merely reaction. This is why we consider the stakes to be so high for developing a new approach, one that we have been calling *rebundling*, the nexus of changes that remix the strategies, building blocks, and structures of our curricula as well as the borders and boundaries of our institutions. Rebundling is a marker for the many ways that the very nature of colleges and universities will change in the years ahead, echoing the kinds of seismic changes that Sidonie Smith invokes in the question she asks in her *Manifesto for the Humanities*:

“Where will one go when one goes to the 21st [century] university?” The answer is multilayered. To the site of bricks and mortar. To a virtual portal. To a network of institutions in globally disparate locations. To a hub in a distributed array of partnerships. To a conjunction of brands. To a sociality of peers, mentors, and strangers.... The university of today participates in

distributed ecologies of inquiry. It is crisscrossed by heterogeneous cultures of learning and teaching. It is animated along interlocking infrastructures that condense time, reorganize space, and realign scholarly identities and relationships.¹

This is the complex context in which we have tried to understand the roles that digital technology and digital culture could play in improving teaching and learning for the next generation. There is ample space, capacity, and opportunity to shape this emerging complexity to make the benefits of liberal education available to broadened population of students. To make this potential a reality requires us to take the best of what we know about learning and imaginatively integrate it with the affordances of the emerging ecosystem in order to redesign and renew what is most distinctive and irreplaceable about colleges and universities.

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From 2003 to 2009, Bass was consulting scholar at the Carnegie Foundation for the Advancement of Teaching, where he had served from 1998 to 1999 as a Pew Scholar and Carnegie Fellow. In 1999, he won the EDUCAUSE Medal for Outstanding Achievement in Technology and Undergraduate Education. Bass is the author and editor of numerous books, articles, and electronic projects. He is currently senior scholar at the American Association for Colleges and Universities.

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Eynon's many articles and books include *The Difference that Inquiry Makes* (with Randy Bass); *Freedom's Unfinished Revolution: An Inquiry into the Civil War and Reconstruction*; and *1968: An International Student Generation in Revolt*; as well as *Who Built America?*, an award-winning series of textbooks, films, and CD-ROMs. A national faculty member for the Association of American Colleges and Universities since 2006, Eynon has been honored for his work by the American Association for Higher Education, the American Council on Education, the Community College Futures Association, and the Carnegie Foundation for the Advancement of Teaching. The national Community College Humanities Association has recognized him as a Distinguished Humanities Educator.



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