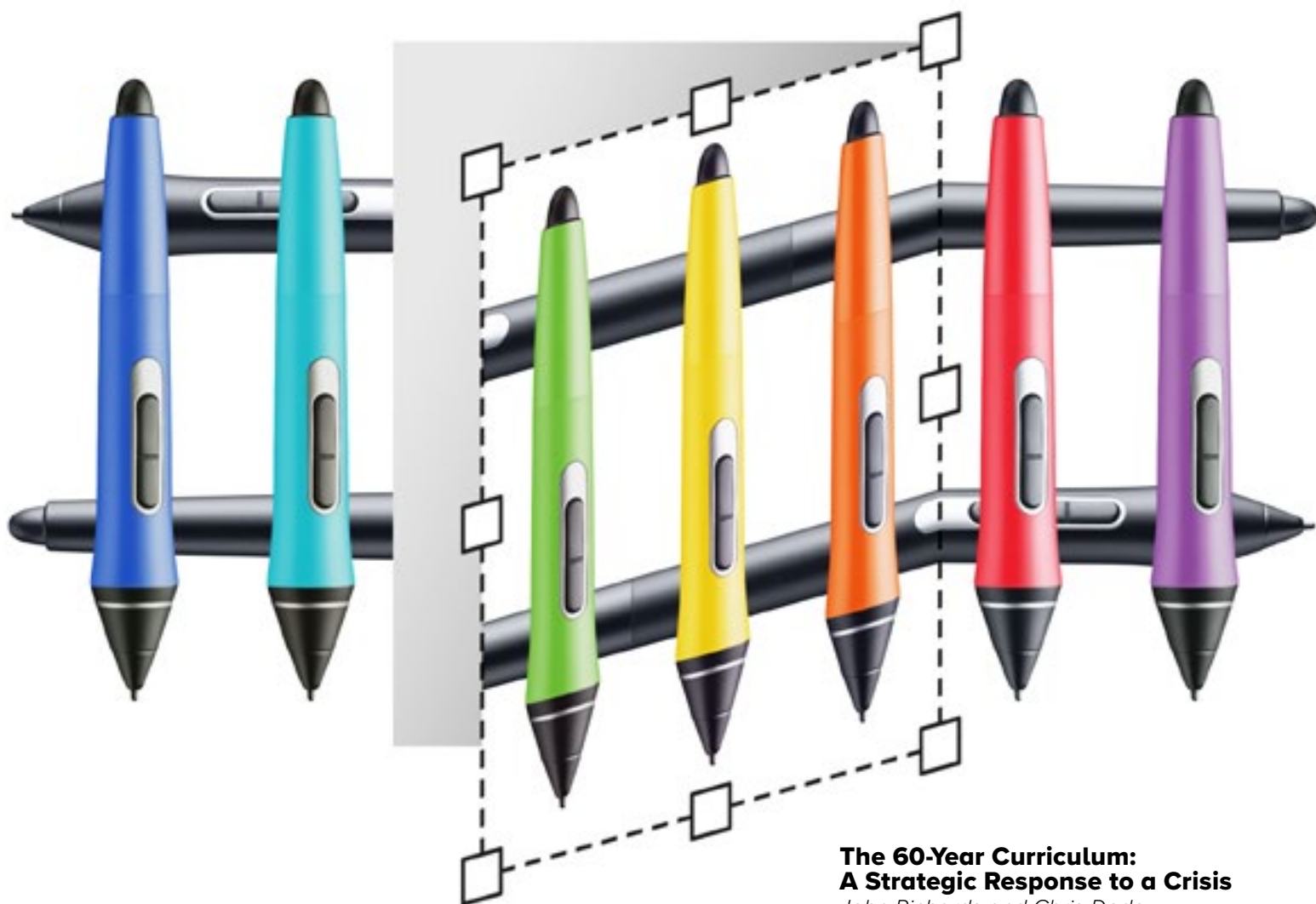# EDUCAUSE
REVIEW

Inclusive Design and Design Justice

Strategies to Shape Our Classes and Communities

Amy Collier

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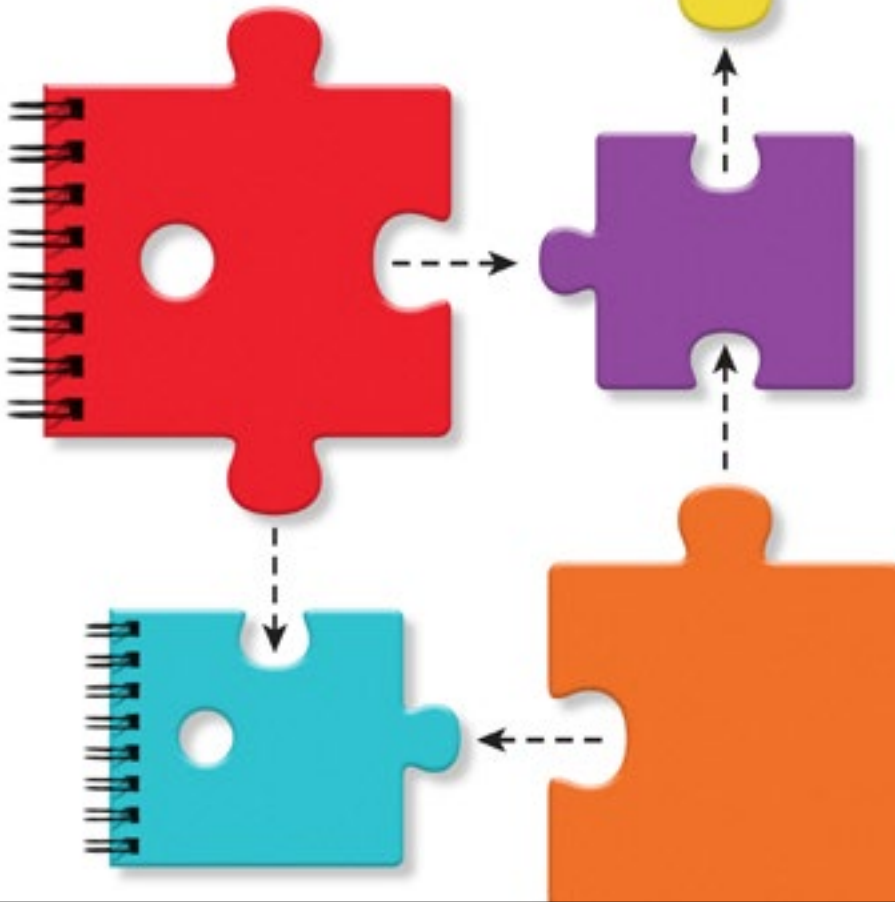Thursday, October 29 | 2:00 PM EST

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Emerging Stronger: EDUCAUSE for the Future

By John O'Brien

Crises are not rare in higher education. Since EDUCAUSE was formed twenty-two years ago by the joining of CAUSE and Educom, the community has faced a recession, a Great Recession, and now, a pandemic. At a more local level, we have seen statewide, provincial, and regional crises, while colleges and universities have dealt with enrollment drops, fires, student tragedies, and so much more. Our community experience has been marked as much by how we weather our challenges as by how we celebrate our successes, but it's impossible to deny that the stakes today are uniquely high as we recognize and navigate a new set of ongoing realities.

I've heard repeatedly that you are not waiting for things to return to normal (whatever that was) but are thinking, urgently and strategically, about what your campus will look like after the adrenaline fades and our collective heart rate returns to calmer rhythms.

EDUCAUSE is moving with you. We are reinventing the association to be more responsive, agile, focused, and collaborative. Yes, these may be words you're hearing tossed around with abandon these days, but for us they also happen to be critical as we work to stay relevant and responsive to you.

One of the most visible signs of the changes I'm talking about is our transition to an all-digital *EDUCAUSE Review*. We did not lightly make the decision to retire the award-winning print edition after twenty years (and another thirty years as *Educom Review* before that). But we know that online publication gets content into your hands more quickly while also ensuring that we can cover the depth and breadth of critical topics that arise for you in real time. *EDUCAUSE Review* consumption has increased by more than 90 percent over the past six months compared with the same time period last year, and we want to continue to meet your needs for timely and relevant material.

While we've adjusted how we share information with you, we're changing what we share as well. For example, we love to provide the thoughtful, deliberate "long-form" research you expect and other content that tracks trends across years, and we will continue to do so. But lately we have increased our focus on agile QuickPolls (a poll

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Continued from page 5

goes out on Monday, with results shared on Friday) and flexible, spontaneous QuickTalks (like this one), for when you need answers *now*. We'll continue to share strategic visions, to think big, and to benchmark across the long term, but you'll also see more applied tools and resources that you can use to solve immediate challenges.

Meanwhile, EDUCAUSE itself has moved to being a fully online employer. We have shifted from 50 percent to 100 percent distributed employees connecting digitally with each other—and with you.

To advance these connections and collaboration, we are excited to be increasing and enhancing mentoring and networking capabilities. EDUCAUSE has launched 1:1 and group mentoring opportunities this fall (learn more here). Mentor matching at EDUCAUSE allows you to pick your own mentor or mentee or use the software to find an appropriate colleague. In addition to our mentoring opportunities, this year's EDUCAUSE Annual Conference attendees will experience enhanced networking capabilities, with community matchmaking embedded in the online event platform. This system is designed so that attendees can connect with others who have similar interests, and it will also help attendees find solution providers in a targeted and meaningful way. In addition, we are working to provide a new community communication resource. After all, email and listservs, though intensively used, shouldn't be the only way for members to connect.

Before the pandemic, we were already expanding our EDUCAUSE Institute programs online, and current events have, of course, accelerated that process. Online versions of the EDUCAUSE Management Institute and New IT Managers Institute were piloted this summer, and we offered a second New IT Managers Institute in September. The Learning Technology Leadership Institute and the Senior Directors Institute will be ready to launch online later this year. Renovations to our Leadership Institute continue as we gear up for more online and hybrid professional development offerings in the long term. Institute programs are open to individuals or teams, with special Institute pricing and scheduling options for campuses or systems team cohorts.

Continuing the "Great Pivot of 2020," all EDUCAUSE conferences in 2020 were moved online, and we're now looking ahead to 2021 to determine how long this online-only focus will extend. We certainly look forward to holding meetings in person as soon as we can, but our new online capabilities will make those events stronger and more accessible to more of our members. We have already heard that the ability to register for an EDUCAUSE event at a fraction of the cost of attending a meeting in person has put our events within reach for so many more.

Finally, as EDUCAUSE moves forward as an organization, we are energized to continue to advance diversity, equity, and inclusion in light of the dramatic worldwide outrage set into motion by events this year. For a social justice crisis spanning hundreds of years, the solution will require a deep and broad effort that combines awareness with action. In 2019 we launched the EDUCAUSE "CIO's Commitment on Diversity, Equity, and Inclusion" to draw attention to this important work. Part of our forward focus is to move beyond statements to emphasize tools, resources, and practices that produce lasting change.

The EDUCAUSE emerging from the current crisis is striving to be more responsive and laser-focused on providing highly relevant content to help you succeed. More surprises are likely in store for all of us. It's just been that kind of year. While the challenges have never been bigger, it's also never been clearer that the EDUCAUSE conceived twenty years ago was designed for exactly this kind of opportunity.

John O'Brien (jobrien@educause.edu) is President and CEO of EDUCAUSE.

Cultivating a Disciplined, Creative Mind and Humane Instincts

"**N** o country," said South African political leader Nelson Mandela, "can really develop unless its citizens are educated." In the midst of today's global pandemic, when the stakes are high and where many see public health, equity, and economic prosperity as rivals in a zero-sum, highly politicized game, Mandela's words suggest that education is about more than employment. What is the connection between education and citizenship, between learning and living a meaningful, free life? And what role do colleges and universities play in preparing people for more than a job?

Higher education institutions are spaces where people *grow* as much as they learn. This distinction is important as we consider how higher education can evolve in a world where content and effective learning guides are freely available and globally accessible. Davidson College uses two phrases to capture attributes that individuals living in community must cultivate: a "disciplined, creative mind" and "humane instincts." In the complexity of modern life, these attributes and habits of mind are as desirable as job-specific skills and domain knowledge.

The Disconnect

Entrenched systems are often slow to respond to new realities. Decades often pass before the opportunities of new technologies begin to make a pronounced impact.[1] Higher education is not immune. Because many institutions had underinvested in digital learning before COVID-19 forced them to switch to remote teaching, they (and instructors) scrambled to offer effective digital content and learning contexts to students accustomed to in-person interactions. Colleges and universities turned to external companies like online course providers and online program managers (OPMs), some of which had already gained traction in this space. The pandemic thus highlighted the value of many edtech providers, and those traditional institutions that adapted quickly recognized the usefulness and potential of learning technologies.

Within this changing landscape, the postsecondary educational sector can expand and diversify to more effectively meet the employment aims of an increasingly heterogeneous learner population. What remains unclear is whether this new ecosystem, with its focus on jobs and reskilling, can also cultivate the human attributes that are required for a populace to sustain a vibrant democracy.

What Works?

Even before COVID-19, some higher education institutions realized their digital unpreparedness and started partnering with organizations to address these gaps. As a result, a growing number of providers, often for-profit, have entered the education sector. The solutions that they offer range from course offerings (Coursera) to capacity building (OPMs), to credentialing services. Corporations such as Google, Microsoft, and Amazon are also offering open education to reskill and retrain the existing workforce, expanding the learning ecosystem well beyond traditional colleges and universities.

From these developments, we've seen that learning materials can be scaled and delivered broadly online. Open educational resources such as MIT's OpenCourseWare or Rice University's OpenStax allow educators to use and reuse learning materials with negligible additional costs for duplicating digital copies. Likewise, instruction can be scaled. In one generation, teaching has gone from the domain of a classroom activity, with at most a few hundred students, to a global classroom that can have thousands or even hundreds of thousands of learners. Early indications suggest that some aspects of tutoring can also be automated through toolsets supported by artificial intelligence.[2] If curriculum, teaching, and parts of tutoring can be scaled technologically, which aspects of the college/university experience remain? What does the traditional higher education experience offer that is not also accessible in online curriculum, instruction, and communities?

Dual Advances

Two related trends raise additional questions about the future of higher education. First, the list of digital learning providers has grown rapidly over the past decade as billions of dollars in venture capital have moved into the edtech sector. Second, technological advances and the growing development of knowledge have strengthened the link between continual learning and workplace advancement. As a result, career-long reskilling is crucial both for individuals and for organizations. Yet many colleges and universities have largely ignored these changing societal learning needs, concentrating instead on their traditional student populations and degree programs. When institutions do have a distance, corporate, or online learning unit that offers evening and weekend classes, these programs tend to assume the traditional course structure, degree programs, and assessment with less investment in teaching. In contrast, emerging providers now offer a range of credentialed options for individuals seeking to reskill.

Consider an employee whose job has been eliminated and who wants to develop skills to secure a role in an emerging field such as data science. A higher education pathway to competence and credentials is expensive, rigid, and slow. In contrast, organizations like Coursera and edX and companies like Guild Education provide access to certificates and degrees in faster, cheaper pathways to career advancement.

Foundational Attributes

Many organizations and companies can deploy new technologies to help learners acquire key skills quickly and inexpensively for the potential benefit of all. Yet what makes these programs effective—a laser focus on skills—also sidelines a set of foundational attributes critical to both long-term career success and engaged citizenship. Cultivating these attributes—which include intellectual curiosity, disciplined goal-setting, self-awareness (metacognition), creativity under pressure, integrity, empathy, and analytical agility—works best in contexts intentionally constructed to require them.

It is in this area that traditional liberal arts colleges can offer a significant contribution to an evolving postsecondary educational sector. Whereas content and powerful pedagogy are now scalable, we (meaning the postsecondary educational sector) have yet to figure out how to create at scale a meaningful context that integrates skills development and domain knowledge acquisition with less-structured educational experiences that cultivate the deeper, human attributes mentioned above. A residential college education brings together the acquisition of field-specific skills (e.g., conducting data analysis, speaking multiple languages, synthesizing new molecules) and domain knowledge (e.g., economics, history, public policy, anthropology) with experiences that cultivate foundational attributes and habits of mind. Such experiential opportunities are generally absent in today's digital environments, which also lack the glue that holds the three components together. Skills and domain knowledge can be acquired, but without a context that integrates less-structured yet carefully curated experiences, other crucial attributes receive little attention. These distinctively human attributes underlie an ability to navigate uncertainty, to see beneath or beyond existing systems of thought, to imagine how others experience the world, and to distinguish the morally relevant from the incidental. A heterogenous democratic republic needs citizens who can ascertain the issues that matter, who can collaborate across our differences, and who can take apart

and build systems (rather than working only within systems that others have created).

Consider young people's experience today. On the one hand, connectivity to peers, family, and friends is constant. Convenient services unimaginable a generation ago are now routine and expected. Much of the world is at their fingertips: banking, entertainment, news, and global social connections. On the other hand, because information moves instantly, young people are keenly aware of all that is out of individual control. Personal accounts of tragedy unfold around the world. Increasing misinformation creates discord and fear. The juxtaposition of an increased awareness and an increased sense of helplessness cry out for analysis and action. We need to do more than manage within this world where pace and speed upend a sense of agency. How can we understand, intervene in, and reconfigure the systems in which we live?

A Next Step

Education for today's digital world must include more than developing skills and acquiring domain knowledge. Foundational attributes such as a disciplined, creative mind and humane instincts should be cultivated through carefully curated experiences. While students can learn how to program online, they require additional experiences to become someone who routinely asks how and why complex systems get created and who can intervene to remake them. Traditional residential colleges and universities are not the only places where these experiences happen. These institutions are, however, distinctive in intentionally and rigorously curating a range of such experiential opportunities and consistently offering them to learners. They are therefore well-positioned to help scale what they distinctively do so well and what our democratic republic so desperately needs. A next step in building a forward-looking educational ecosystem that serves all learners may be to tap the expertise of these most "traditional" institutions. Now more than ever, a society that strives to be free and democratic requires holistically educated citizens. ■

> **Education for today's digital world must include more than developing skills and acquiring domain knowledge.** Foundational attributes must be cultivated through carefully curated experiences.

Notes
1. Paul A. David, "The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox," *American Economic Review* 80, no. 2 (1990).
2. A. C. Graesser, M. W. Conley, and A. Olney, "Intelligent Tutoring Systems," in K. R. Harris et al., *APA Educational Psychology Handbook*, vol. 3: *Application to Learning and Teaching* (Washington, DC: American Psychological Association, 2012).

Carol Quillen is President of Davidson College. **George Siemens** is Co-Director at the Centre for Change and Complexity in Learning at the University of South Australia and is Professor at the University of Texas, Arlington.

Inclusive and Design

Strategies to Sh
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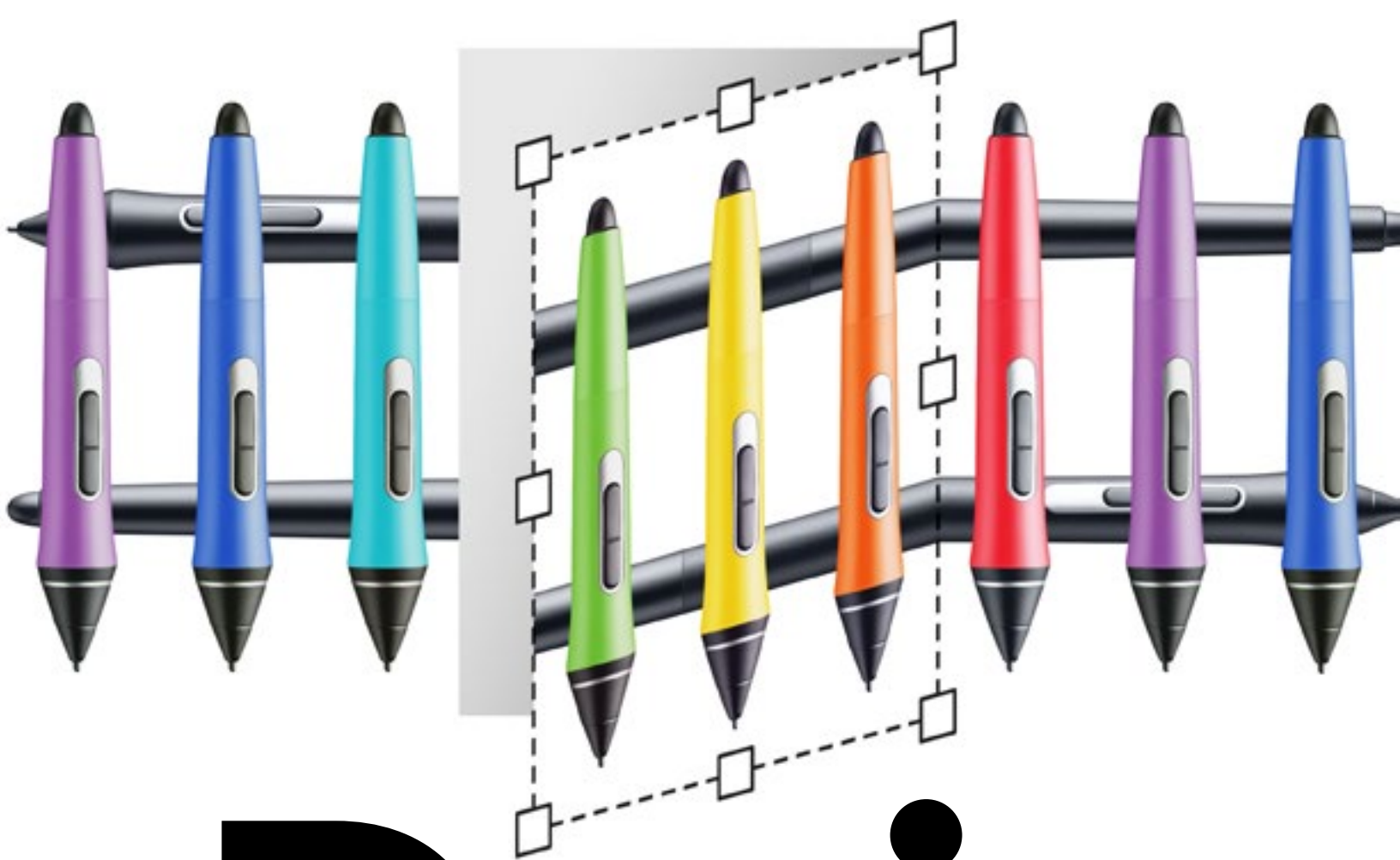
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Justice

By Amy Collier

Illustrations by
Matt Chase

Design matters in higher education.

In her book *Mismatch*, Kat Holmes writes, "Design shapes our ability to access, participate in, and contribute to the world."[1] When we think about what that means in education—that design shapes students' ability to access, participate in, and contribute to meaningful, transformative learning—we are reminded how seriously we should be taking the concept of design in education. In her introduction to the keynote address at COLTT 20, Theodosia Cook, chief diversity officer for the University of Colorado system, commented about the context of higher education in the United States:

> As I say these two phrases—*inclusive design, design justice*—I struggle to understand why some in our country are against these principles, these methodologies, when our creed states our government should be one of the people, by the people, and for the people. I would hope that you consider that the United States sits on the land of indigenous people, grew its wealth through enslaved Africans, expanded its territory by taking Mexican indigenous people's property, created railroad tracks off the backs of Chinese immigrants, and has always had its borders open to European immigrants who used this country as a penal colony where White convicts were allowed to come work off their debt and grow their wealth.… Our country today is in dire need of living up to its creed, and we can only do that if we embrace and live out the principles of inclusive design and design justice.[2]
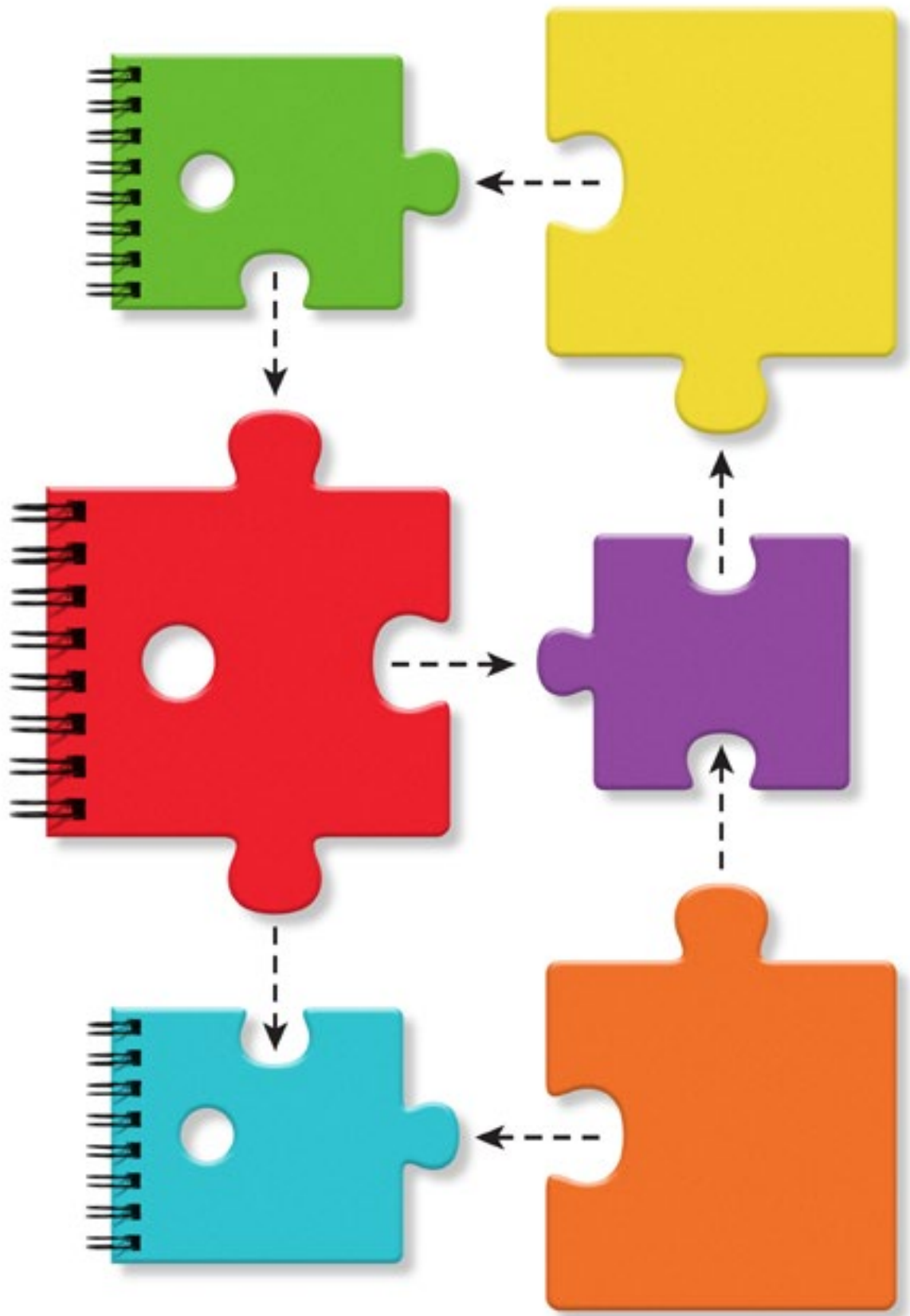
As she notes, when there is both a growing realization of structural inequities across our social systems, including and especially our educational systems, and a denial on the part of many that such inequities exist, we are reminded of how critically we should be examining our designs and design processes in higher education.

We engage in design in many ways at educational institutions: from instructional design, to curricular design, to classroom design, and more. Yet design processes are often obscured or kept private as individuals or groups make decisions—for example, about how they will teach courses or which technologies will be used to support teaching and learning. There are few processes that encourage us to look critically at our designs and design processes. We know that uncritical design approaches—designs that do not intentionally attend to the experiences of marginalized and disenfranchised learners—perpetuate and even exacerbate inequities.[3] That is why we should look to embrace design approaches that are attentive to our learners for whom education has not typically been designed. Inclusive design and design justice provide frameworks and practices for doing so.

Inclusive design is "design that considers the full range of human diversity with respect to ability, language, culture, gender, age, and other forms of human difference."[4] It goes beyond accessibility, though accessibility is considered within inclusive design. Inclusive design celebrates difference and focuses on designs that allow for diversity to thrive. In higher education, this means asking ourselves, "Who has been served, supported, or allowed to thrive by our educational designs and who has not?" And, "How might we design for inclusion of more students?" This refers not just to the privileged students, or the ones we understand,[5] or those studied by researchers. Not just to those who look like us or act like us. Kevin Gannon has written that inclusive design in education is "a realization that traditional pedagogical methods—traditionally applied—have

> **We engage in design in many ways at educational institutions: from instructional design, to curricular design, to classroom design, and more. Yet design processes are often obscured or kept private as individuals or groups make decisions.**

not served all of our students well. It's a commitment to put actual substance behind our cheerful declarations that all students deserve access to higher education." Gannon goes on to explain that the benefit of inclusive design is that it works to the benefit of many students, not just those who have been disenfranchised. "The beauty of inclusive pedagogy is that, rather than making special accommodations that would decrease equity, it actually benefits *all* students, not just those at whose needs it was originally aimed."[6] An inclusive design orientation pushes back on "best practices" in education and instead asks, "For whom are those best practices good, and for whom are they not?"

Design justice, meanwhile, is design work that centers and prioritizes people who have been marginalized by design.[7] Design justice advocates ask us to recognize how designs exclude or even exploit some people and communities, and it
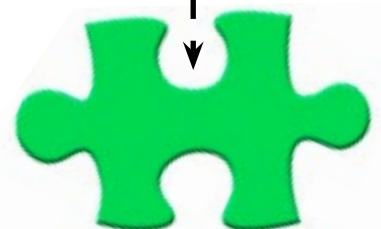
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challenges us to approach design with a focus on justice for those people and communities. In the book *Design Justice,* Sasha Costanza-Chock states that the goal of design justice is to more equitably distribute the benefits and burdens of design. In higher education, we should recognize that our educational designs have both benefits and burdens for students and we should embrace design processes that bring a more equitable distribution of benefits to as many learners as possible by centering the experiences and needs of learners who are marginalized by our educational designs.[8] This means taking a hard, critical look at our educational designs and recognizing exclusions and even exploitations.

In practice, inclusive design and design justice are challenging to achieve. They require constant reevaluation of the design choices we make in order to recognize how each choice can open up new forms of exclusion and barriers for learners. Working toward inclusive design and design justice involves listening to learners, being willing to learn sometimes hard and painful lessons, and adjusting designs based on learners' input. This process can be overwhelming, especially if there is little or no institutional support. In our digital learning group at Middlebury College, we use the framing concepts of "small moves" and "big moves." Small moves help us to identify the things we can change now and to approach those changes iteratively. Small moves are a start, but they are not enough. We need big moves too. Big moves involve organizing and investing in marginalized communities as well as pushing back on institutional policies, procedures, and structures that create and exacerbate inequities.[9]

If we understand the imperative for inclusive design and design justice, how do we work to achieve these principles? There are many strategies, but here I will highlight three that we have been discussing and exploring in my group at Middlebury: going beyond accommodations; embracing participatory design; and focusing on justice.

In practice, inclusive design and design justice are challenging to achieve. They require constant reevaluation of the design choices we make in order to recognize how each choice can open up new forms of exclusion and barriers for learners.

Going Beyond Accommodations

According to the Inclusive Design Research Center: "It is the responsibility of inclusive designers to be aware of the context and broader impact of any design and strive to effect a beneficial impact beyond the intended beneficiary of the design. Inclusive design should trigger a virtuous cycle of inclusion, leverage the 'curb-cut effect,' and recognize the interconnectedness of users and systems."[10] The "curb-cut effect" refers to how changes in the built environment for the purposes of accessibility (e.g., curb cuts) can have benefits beyond their intended purpose (e.g., aiding those with strollers, wheeled luggage, and bicycles). Similarly, in higher education, eliminating course and institutional barriers for marginalized students helps to create paths for additional students with a wider range of "fit" issues. Accommodations alone are not enough to achieve inclusion; when we go beyond accommodations, we create paths that help and support many learners, not just those who need or want accommodations.

Going beyond accommodations involves designing for flexibility, choice, and empowerment. A great example is Professor Michael Wesch's use of mixtapes—recordings of weekly course readings and other materials. [11] While helpful and maybe necessary for students who need accommodations, the mixtapes also provide support for students facing other learning barriers, such as time limitations due to work or long commutes. Similarly, Professor Maha Bali provides multiple paths that students in her digital literacy course can take to reach their goals. Students can explore those best suited to their needs and, in doing so, co-design their own learning.[12] A third example is the Open CoLab's ACE Framework at Plymouth State University. This framework provides guidance for assignment-level, department-level, and institutional-level strategies to go beyond accommodations and toward more inclusive practices. For instance, at the assignment level, flexible deadlines and student-designed
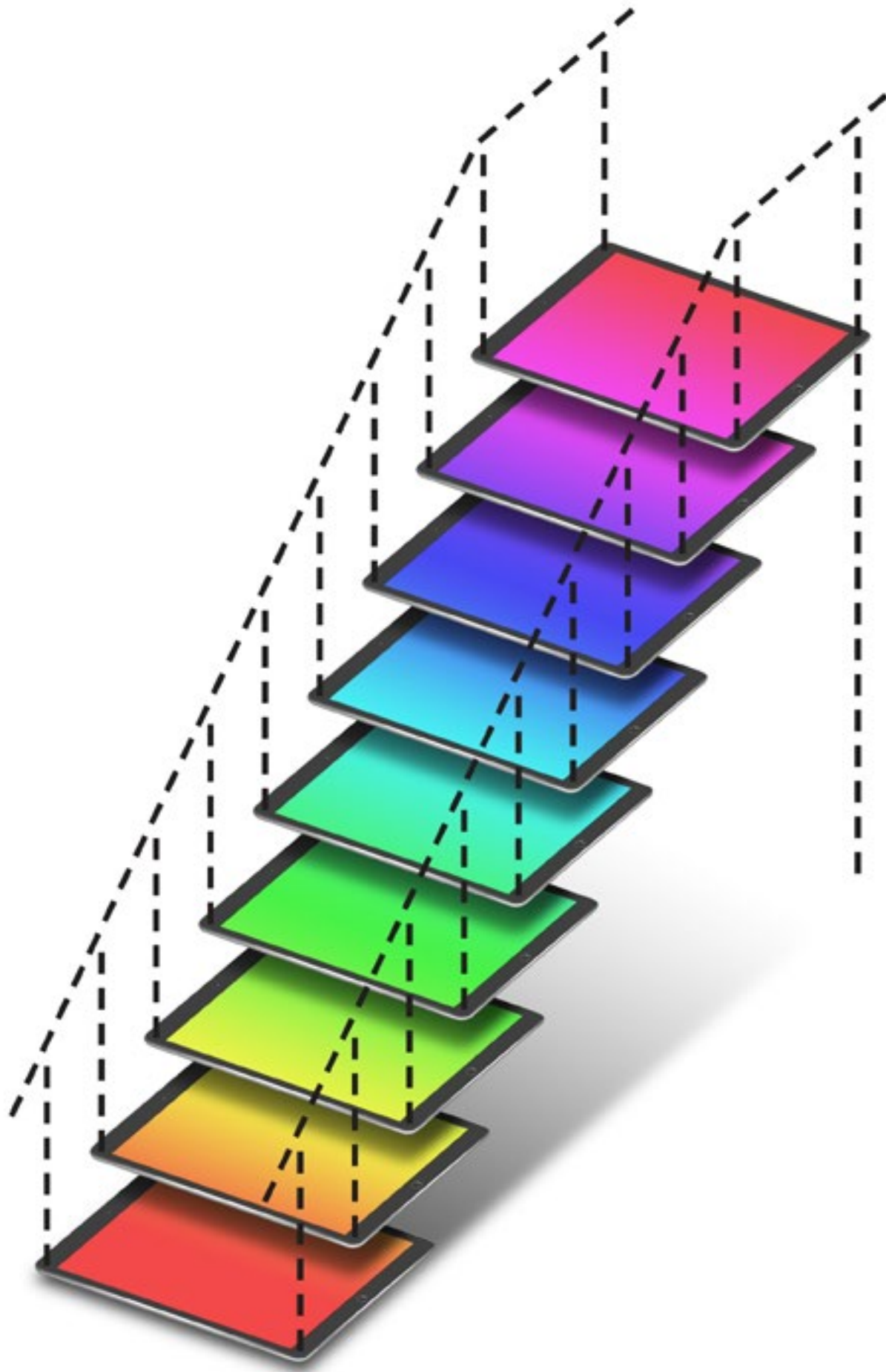
assignments and student choice about how to complete assignments are solid ways of practicing "designing for flexibility."

Embracing Participatory Design

In "Design Justice, A.I., and Escape from the Matrix of Domination," Costanza-Chock emphasizes: "Design mediates so much of our realities and has tremendous impact on our lives, yet very few of us participate in design processes. In particular, the people who are most adversely affected by design decisions—about visual culture, new technologies, the planning of our communities, or the structure of our political and economic systems—tend to have the least influence on those decisions and how they are made."[13] A key tenet of both inclusive design and design justice is intentionally centering the voices and experiences of the people for whom you're designing, especially those who are typically marginalized by design.

Inspired by the Detroit Digital Justice Coalition's DiscoTechs[14], created via a robust participatory model, the digital learning and inquiry (DLINQ) group at Middlebury created a series of CryptoParties for faculty and students. CryptoParties are hands-on events that encourage participants to reclaim some control over their privacy and data, taking it back from technology companies that extract and exploit those data for their profit. Designing and cohosting these events with student groups across the institution meant spending time listening to their concerns, sharing examples of privacy issues they face, and co-designing how events could serve students well.

Outside of formal curriculum, participatory design may seem straightforward, but inside the formal curriculum there are fewer opportunities for participatory design to take shape. For example, faculty typically design part or most of a class before they meet their students. Bringing participatory design into the classroom, providing opportunities for students' perspectives and voices to shape the learning experience, can be challenging, especially given constraints on faculty members' time and freedom in the classroom (e.g., faculty may be given a syllabus and told to teach a course in accordance with that syllabus).

Yet there may still be ways to encourage participatory practices. Courtney Plotts proposes inviting students to co-construct classroom values by using collaborative technologies to collect students' perspectives.[15] In a post to his blog, Kevin Gannon suggests a Progressive Stack approach to discussion: "Classroom discussions, without mindful guidance and a commitment by participants to fairness and inclusion, are often dominated by those with the loudest voices

An orientation toward justice means that we and our students cannot accept the exclusions that are baked into our learning environments and our society. **Justice means we have to ask, "What's wrong?" And we must take action to fix what's wrong.**
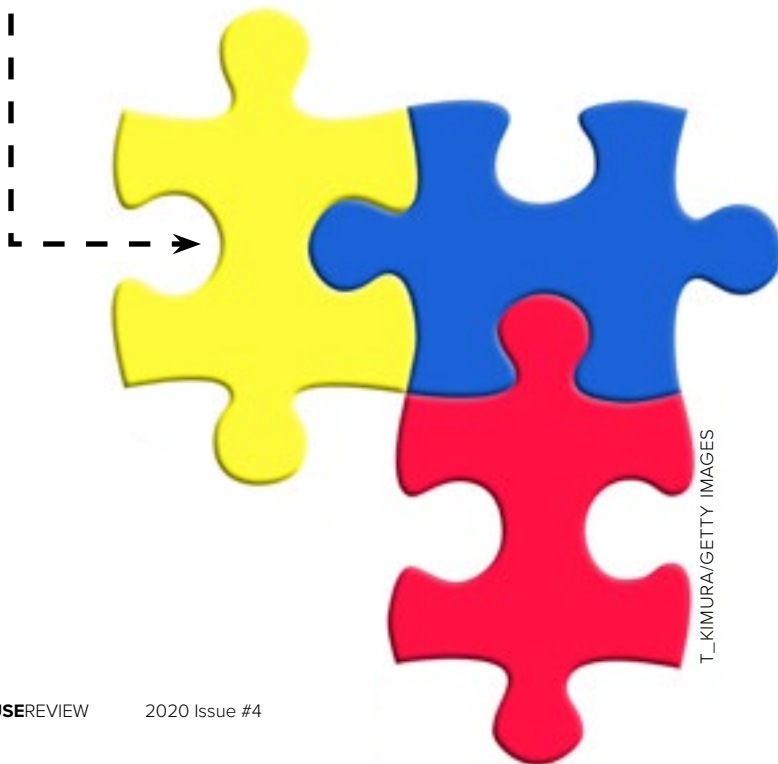
and quickest at raising their hands—or, in too many cases, those most willing to interrupt others." The Progressive Stack is a way of structuring a discussion that makes space first for the contributions of students who identify as a member of any marginalized group. Gannon also points to Danica Savonick's full description of the approach.[16] Co-teaching with my colleague Netta Avineri at Middlebury, I learned how free writing exercises can help students unsilence themselves and recognize that their voices are necessary for change, including change in our courses.[17] Finally, Autumm Caines and Erin Glass also provide a model for participatory design, issuing a syllabus-based call for students to recognize and push back on the extraction and exploitation of technologies that they are expected to use as part of their learning (e.g., the LMS, proctoring software).[18]

Focusing on Justice

The educator Megan Erickson states: "There are many reasons to start with 'What's wrong?' That question is, after all, the basis of critical thought. Belief in a better future feels wonderful if you can swing it, but it is passive, irrelevant, and inert without analysis about how to get there. The only people who benefit from the 'build now, think later' strategy are those who are empowered by the social relations of the present." After quoting Erickson, the educator Sherri Spelic takes this idea further: "Our students can see inequality. Many of them experience its injustices on a daily basis. Precisely here is where I would like to see us focus our educator energies: on helping students see and identify the faulty designs throughout our society that plague the most vulnerable among us. In order to dismantle and correct these designs and patterns, they must first be able to notice and name them. That's the kind of design thinking I hope and wish for: Where 'what's wrong?' drives our pursuit of 'what if?'"[19]

An orientation toward justice means that we and our students cannot accept the exclusions that are baked into our learning

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environments and our society. Justice means we have to ask, "What's wrong?" And we must take action to fix what's wrong. Think of exclusionary designs in educational settings. Some examples are obvious: student information systems that require students to identify as either male or female.[20] Other exclusions are found in "hidden curriculum" or in the requirement for students to join online or remote classes synchronously or even in the lack of diversity among authors of the readings we assign.[21] Part of the work of inclusion is, first, being attentive to where designs in higher education marginalize students and, second, taking steps to counteract those exclusions.

Justice-oriented designs often require big moves, ones that may call for collective action. At Middlebury, we've been inspired by, for example, Mapping Access, a participatory data-collection and accessibility mapping project of the Critical Design Lab. The project provides resources to help staff map problems of access and equity on their campuses, such as locations where construction impedes transit to buildings or locations of buildings without gender-neutral bathrooms. Another example is the Right to Learn Undergraduate Research Collective (R2L) at the University of Colorado Denver. Directed by Professor Manuel Espinoza, this student research group aims to propose amendments to the Colorado Constitution in support of education as a fundamental right of personhood. The group uses the social annotation tool Hypothesis to annotate legal filings and build a case for legislative change in Colorado. Finally, the Marginal Syllabus, cofounded by Remi Kalir and Joe Dillon, is a community of educators who explore educational equity topics. Marginal Syllabus fosters robust conversations between educators and scholars who are at the margins of dominant educational narratives; these conversations take place in the margins of texts (via Hypothesis) and in video meetings.

These examples show how asking "What's wrong?" can lead to designs that focus on justice for marginalized and disenfranchised teachers and students.

Conclusion

I want to conclude with a warning and a call to action. More than a generation ago, bell hooks wrote: "Within white supremacist capitalist patriarchy, we have already witnessed the commodification of feminist thinking (just as we experience the commodification of blackness) *in ways that make it seem as though one can partake of the 'good' that these movements produce without any commitment to transformative politics and practice*. In this capitalist culture, feminism and feminist theory are fast becoming a commodity that only the privileged can afford."[22] I want to caution, as hooks does, against making gestures toward inclusive design and design justice without committing to the transformation required to change the structures of inequality and oppression that shape our students' lives. There is real, and challenging, work to do, and we cannot allow ourselves to stop at small moves.

Those of us who work in digital learning or IT orgnizations need to recognize (1) how educational technologies perpetuate and exacerbate inequity and (2) the need for justice-oriented work in this area. While digital learning can be a site of liberatory pedagogical practices, the tools and approaches we use are often antithetical to our goals. This is particularly true of learning technologies that are fueled by students' data (i.e., in which students' data are extracted and used/sold for profit). Thinking about how to reject these exploitative tools, pervasive in our educational institutions, is challenging. But it's time for us to take action. My call to action, inspired by the Feminist Data Manifest-No, is for digital learning organizations to draft and publish anti-racist and justice-oriented statements that acknowledge the harm our work can do and that outline the steps we can take to fight against that harm. ■

Notes

I want to acknowledge Sarah Lohnes Watulak, my colleague and friend at Middlebury, who introduced me to research about inclusive design and design justice and to the inspiring people working in these fields.

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This article is based on the keynote address delivered at the Colorado Learning and Teaching with Technology (COLTT) Conference, August 5, 2020.

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The 60-Year Curriculum

A Strategic Response to a Crisis

By John Richards and Chris Dede

Illustrations by Nathalie Lees

Profound changes in underlying technology (digitization), in combination with root and branch organizational adaptation (reengineering, or what is often called "digitalization"), have altered the global, socioeconomic environment. These forces of change and adaptation have produced what we are calling "the synergistic digital economy." Students and workers in the synergistic digital economy no longer expect that their jobs will represent a progression through a single career during a lifetime. They instead expect that their current job or career will, at some point, disappear or evolve, forcing them to prepare for novel jobs in several new careers at unpredictable points throughout their lives. The requirement to prepare for a lifetime of changing employment is not optional.

After decades of procrastination, higher education has finally been spurred, by the necessity of the COVID-19 pandemic, to enter the 21st century and offer online courses tailored to the needs of the synergistic digital economy for nontraditional students across a spectrum of ages and career stages. However, we worry that the forced migration to online education could end up as a threat to further progress unless change-resistant nostalgia for the historic model is replaced by a strategic response geared toward and welcoming future evolution.

In our recent book *The 60-Year Curriculum: New Models for Lifelong Learning in the Digital Economy*, we argue that these disruptive shifts in higher education and in working lives require a revolution in educational objectives. Our book title comes from a term first coined by Gary Matlin, dean of the Division of Continuing Education and vice provost of the Division of Career Pathways at the University of California, Irvine. The "60-Year Curriculum" (60YC) refers to a new perspective oriented toward continuing education and centered on six decades of employment, requiring a lifetime of learning in the context of repeated occupational change and transition.[1]

In our judgment, the suggestiveness of this term is very powerful, and the elaboration of this perspective underscores the need for a reevaluation of the nature and purpose of higher education. The importance of the shift in point of view was highlighted in a 2012 report by the US National Research Council. *Education for Life and Work* posited that flexibility, creativity, initiative, innovation, intellectual openness, collaboration, leadership, and conflict resolution are essential skills for each person to have.[2] Yet these are not currently a major focus of higher and continuing education.

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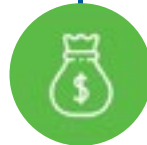
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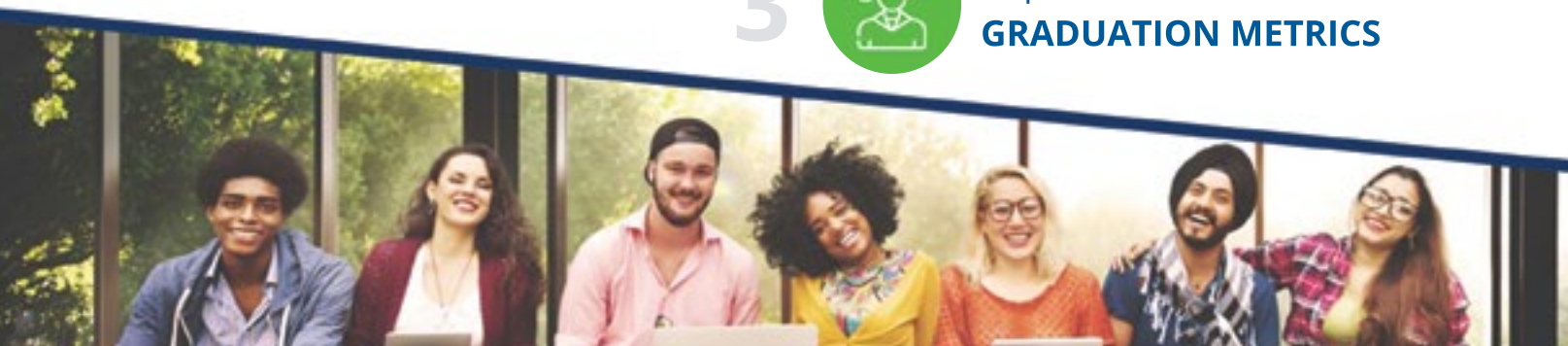**1** Recruit Best-Fit Candidates and **MEET YOUR GOALS**

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Forces Driving Change

The World Economic Forum's *Future of Jobs Report 2018* described a new human-machine frontier within existing tasks:

Companies expect a significant shift on the frontier between humans and machines when it comes to existing work tasks between 2018 and 2022. In 2018, an average of 71% of total task hours across the 12 industries covered in the report are performed by humans, compared to 29% by machines. By 2022 this average is expected to have shifted to 58% task hours performed by humans and 42% by machines. In 2018, in terms of total working hours, no work task was yet estimated to be predominantly performed by a machine or an algorithm. By 2022, this picture is projected to have somewhat changed, with machines and algorithms on average increasing their contribution to specific tasks by 57%. For example, by 2022, 62% of organization's information and data processing and information search and transmission tasks will be performed by machines compared to 46% today. Even those work tasks that have thus far remained overwhelmingly human—communicating and interacting (23%); coordinating, developing, managing and advising (20%); as well as reasoning and decision-making (18%)—will begin to be automated (30%, 29%, and 27% respectively). Relative to their starting point today, the expansion of machines' share of work task performance is particularly marked in the reasoning and decision-making, administering, and looking for and receiving job-related information tasks.[3]

Similar conclusions about the challenge of technology-driven career growth and career change are reached in 2019 reports from the Organization for Economic Cooperation and Development and the Southern Regional Education Board.[4] The impact of the pandemic is now accelerating this shift.

Meanwhile, the Brookings report *Automation and Artificial Intelligence* indicates that almost no occupations will be unaffected by artificial intelligence (AI) and that about one-quarter of US jobs will face high exposure to automation in the coming decades.[5] In response, the authors recommend five major public policy agendas; the two closely related to this article are to promote a constant learning mindset and to create a universal adjustment benefit to support all displaced workers. The latter could be actualized through federal initiatives such as employability insurance, which could serve as a potential funding source for the 60YC.

As Daron Acemoglu and Pascual Restrepo have noted, AI focused on automation reduces employment, but AI focused on new tasks where labor can be productively employed may increase jobs and develop new types of meaningful work. A crucial issue here is applying AI to create a division of labor in which

The metaphor we propose for the 21st-century workplace of education is a "Global Network," in which participants with multiple careers and many "gigs" within each career reflect the shift from centralized to distributed organizations, from predefined to ad hoc work, and from a role-based to a consultant model of agency.

mid-range and lower-range jobs are worthwhile and respected as opposed to making people the eyes and hands of machines that govern their behavior.[6]

Education is our most powerful lever for systemically shaping the future. However, typical courses at every level are often shaped by one-size-fits-all presentational/assimilative instruction. Curriculum standards are filled with data that is easy to memorize and measure but useless in a world of search engines. In a system dominated by drive-by summative assessments, students cannot learn capabilities and dispositions vital

for the disruptions they must overcome. Strengths such as resilience, perseverance, collaboration, conflict resolution, and forging opportunity from uncertainty cannot be attained in classrooms where compliance and not-making-waves are the central behaviors demanded from instructors.

As for measuring success by high-stakes tests, such an approach prepares students for jobs that will be deskilled by AI. Instead, students should learn what AI *cannot* do, thus preparing themselves for roles upskilled though intelligence augmentation (IA).[7]

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Table 1. Knowledge and Skills

Cognitive	Intrapersonal	Interpersonal
Cognitive processes & strategies	Intellectual openness	Teamwork & collaboration
Knowledge	Work ethic & conscientiousness	Leadership
Creativity	Positive core self-evaluation	Communication
Critical thinking	Metacognition	Responsibility
Information literacy	Flexibility	Conflict resolution
Reasoning	Initiative	
Innovation	Appreciation of diversity	

Implications for Curriculum and Instruction

We take the term "curriculum" in the 60-Year Curriculum to refer collectively to all the elements of educational experience. It includes not only andragogy and educational content but also services that sustain instructors and learners at multiple stages of their lives and careers. A new metaphor is needed for this new learning and teaching model that serves a lifelong need. Whereas education had previously adopted factory and then office models of education, these no longer apply (if they ever did). The metaphor we propose for the 21st-century workplace of education is a "Global Network," in which participants with multiple careers and many "gigs" within each career reflect the shift from centralized to distributed organizations, from predefined to ad hoc work, and from a role-based to a consultant model of agency. The transformative changes between educational eras parallel the moves from shopping in urban centers to shopping in malls to shopping online. Workers in the Global Network era include not just musicians and startup teams but also Uber drivers, telecommuting professionals, graphic artists with multiple clients, freelance writers, authors, and copyeditors, and adjunct faculty members with a portfolio of teaching contracts.

Thriving in a Global Network requires skills in three "domains of competence": cognitive, intrapersonal, and interpersonal.[8] Table 1 categorizes a broad range of knowledge and skills vital in the 21st century, grouped by these three dimensions.

The knowledge and skills are variously referred to as "21st-century skills," "college and career readiness," "deeper learning," and "higher order thinking." Although there may be important differences among such categories, we refer to them simply as "21st-century skills."

Students' capacity to cope with rapid, unpredictable change in the workplace and in society throughout six decades of working life depends on educators' helping them to build and exercise 21st-century skills in each domain of competency—not only during the college university experience but also in the pre-K–12 experience. Students need to develop and apply general-purpose knowledge and skills that can transfer to novel situations. But teaching how to transfer skills—how "to extend what has been learned in one context to new contexts"—is notoriously difficult.[9] Transfer is "affected by the degree to which people learn with understanding."[10] In other words, for transfer of cognitive skills to occur, deep learning must take place. This requires deliberate practice, an understanding of when, where, and why to use the knowledge, and an underlying motivation to apply what has been learned—all of which likely occurs in a person's first career. The extent to which this first career experience applies to career shifts is an important area for research.

The student, as a 21st-century Global Network worker, consults in a variety of roles on multiple current projects in a distributed environment. The model of the

Students' capacity to cope with rapid, unpredictable change in the workplace and in society throughout six decades of working life depends on educators' helping them to build and exercise 21st-century skills in each domain of competency.

Table 2. Evolving Models of Education

	Factory	Office	Global Network
Curriculum	Grade School	College	60 Years
Nature of Work	Manufacturing Production	Knowledge Work	Consulting Entrepreneurship
Era	Industrial	Information Processing	Digitalization
Cognition Model	Warehouse	Process	Agile Network
Learning	Information Transfer	Thinking Skills	Transferable Skills
Student Role	Clerk	Symbolic Analyst	Consultant Entrepreneur
Unit	Individual	Team	Dynamic Teams
Content	Curriculum	System	Project Deliverable
Teacher Role	Lecturer Information Resource	Facilitator Process Resource	Mentor Coach Advice Resource
Assessment Method	Test Time in Job	Authentic Degree	Performance Deliverable Portfolio
Pedagogy	Telling	Enabling	Empowering

student's mind is an agile network of data and processes. Learning takes place just in time, depends on underlying transferable skills, and relies on relevant content and processing tools being readily available. The student/worker functions as an entrepreneurial consultant who works simultaneously on multiple ad hoc teams with changing collaborators.

The instructor functions as a coach, providing continuity, perspective, and methods. Performance assessment focuses on project deliverables. Preparation for a lifetime of such work requires developing the ability to learn continually and the capability to adapt to new and unpredictable situations. Consequently, education in the Global Network era requires a 60-Year Curriculum that employs an andragogy combining collaborative tactical problem solving with the strategic objective of developing transferable competencies (see table 2).

We approach the methodology that is required from the perspective of learning engineering, emphasizing the applied nature of adaptive instructional

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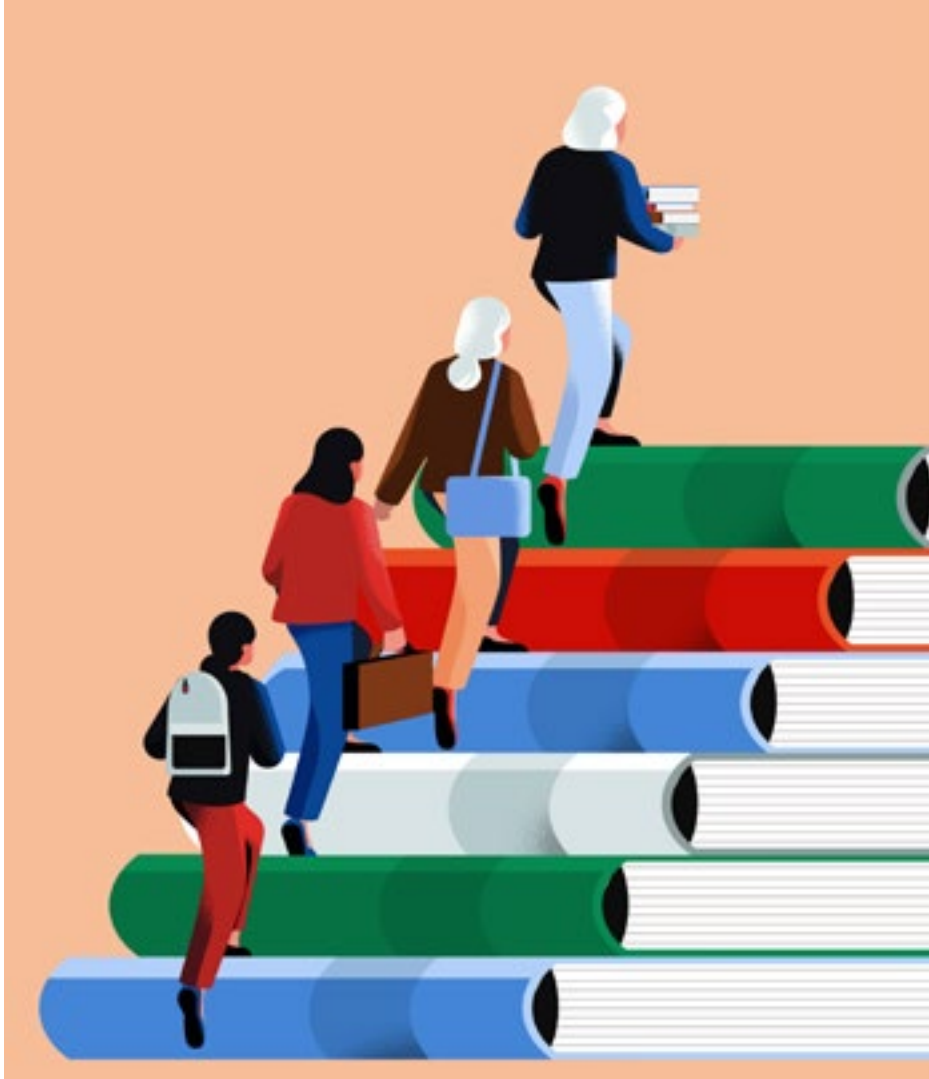- Payment Plan Trends (on-demand)

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methods and dynamically configurable infrastructure.[11] Thus, our approach to satisfying the demand for lifelong learning is to base education on innovations in andragogy, rather than content. These new andragogies are enabled by the technologies and processes of the synergistic digital economy. There clearly could be new courses that are explicitly dedicated to novel aspects of the synergistic digital economy. However, the literacies and capacities that result from our approach do not in themselves form a new discipline or a novel curriculum. Instead, the existing curriculum of every course and program is reconfigured to reflect changes in instructional methods that establish and support habits of lifelong learning. The result is a new pattern of educational interaction, more than new substance.

The synergistic digital economy is inexorably changing what, when, and how we are learning. Online learning has removed artificial residential and temporal restrictions on courses and has

matured in teaching and learning platforms that achieve immersion and enable open agency. The resulting hybrid 60-Year Curriculum makes it possible to establish and sustain six-decade-long relationships between learners and institutions.[12]

What is the form of these relationships? Moving existing face-to-face classes to Zoom meetings was merely a tactical response to crisis. How will courses and education itself further adapt to serve the world that students now face? How will learners and institutions evolve their relationship? Moreover, how will the higher education institution support learners to leverage, or transfer, the skills and competencies from one career to a new career? This returns us to the problems of teaching transferable cognitive skills. Transfer is successfully influenced by whether "the training introduces desirable difficulties (those that pose a manageable level of challenge to a learner, but require learners to engage at a high cognitive level)."[13]

Now is the time for faculty and researchers to experiment with strategic goals in the context of tactical necessities. In so doing, they must learn to leverage hybrid education and balance real and virtual experiences to engender deeper learning. That strategic objective should guide tactical responses to the present crisis and plans for emerging from it.

Conclusion

Whatever models emerge, they must include strategies that help those involved in education—both providers and students—to transformatively change their behaviors. In our opinion, the biggest barrier we face in this process of reinventing our current methods, models, and organizations for these activities is unlearning. All of us have to let go of deeply held, emotionally valued identities in service of transformational change to a different, more effective set of behaviors.[14] This is both individual (an instructor transforming presentation and assimilation practices to active, collaborative learning by students) and

institutional (a higher education institution transforming degrees certified by seat time and standardized tests to credentials certified by proficiency or competency-based measures).

Unlearning requires not only novel intellectual insights and approaches but also individual and collective emotional and social support for shifting our identities—not necessarily in terms of fundamental character and capabilities but, rather, in terms of how character and capabilities are expressed as our context shifts over time. We believe the success of any transformative model for education will rest on its inclusion of powerful methods for unlearning and capacity building in the people who will implement this new approach. This disruptive shift sets the stage for two dimensions of research that are critical to creating the 60-Year Curriculum. First, how do we implement a Global Network andragogical approach across the college/university? Second, how do we distribute and sustain the learning relationship between students and faculty and the higher education institution across a lifetime? ∎

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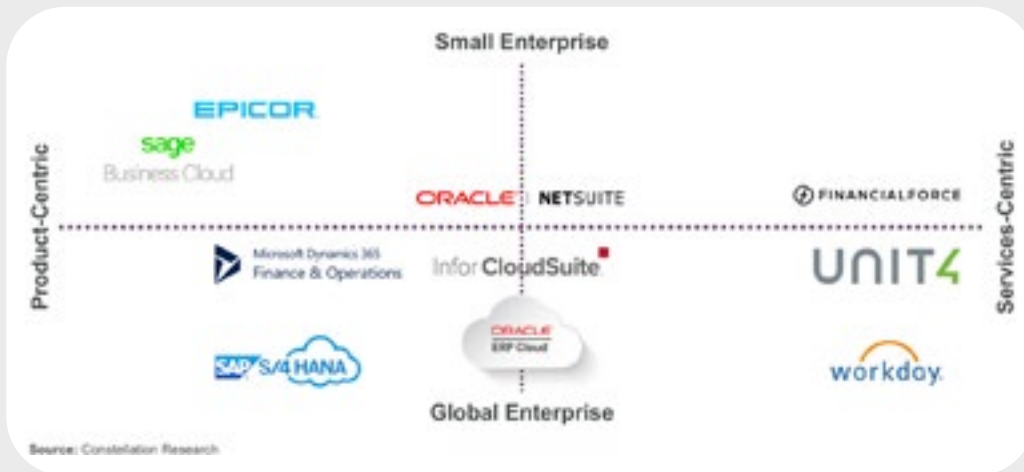
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THE LANDSCAPE OF MERGING MODALITIES

BY VALERIE IRVINE
ILLUSTRATIONS BY PAVEL POPOV

On today's higher education campus, there are likely a dozen new terms being used to describe different configurations around the modality of courses. *Modality* typically refers to the location and timing of interactions. What used to be a simple binary of *face-to-face* or *online* has now become so extremely complex that our ability to understand each other is impaired.

History of Modality

In the early, simpler days of online teaching and learning, somewhere in the middle of the 1990s (not including radio or written correspondence courses), the lack of high-speed internet limited communication primarily to text. *Online* meant only one thing: text-based, *asynchronous* learning. In asynchronous learning, communication is *not* happening at the same time or "live." Instead, it is time-delayed through tools such as email, static websites, and forums, albeit sometimes these were supplemented with the random image and some manual emoticons :-). This learning was also openly accessible by default, a fact that got lost somewhere along the way, but we have been finding our open origins again in the last decade. *Blended learning* emerged in North America as a term to refer to the mix of on-campus/face-to-face learning and online activities. This learning was typically referred to in a consecutive manner: instructional hours were reduced to allow for online interactions, or those online interactions were seen as supplemental to the face-to-face experience. In other parts of the world, such as Australia, *hybrid learning* was the equivalent term for blended learning, so the two have been synonyms for decades.

The mid-1990s was the last time these terms were comprehended with simplicity. In the late 1990s, as residential internet speed increased along with the sophistication of personal hardware, we also saw the emergence of web-based software that enabled *synchronous* communication. Interactions could now happen "live," such as via a phone call. Learners were able to gather around a shared online slideshow where disembodied voices could take turns asking questions or sharing commentary. As some online-only courses began to integrate synchronous learning into the asynchronous courses, the term *blended online learning* later emerged—creating the first layer of semantic confusion.[1]

Further advances around the turn of the millennium brought in videoconference

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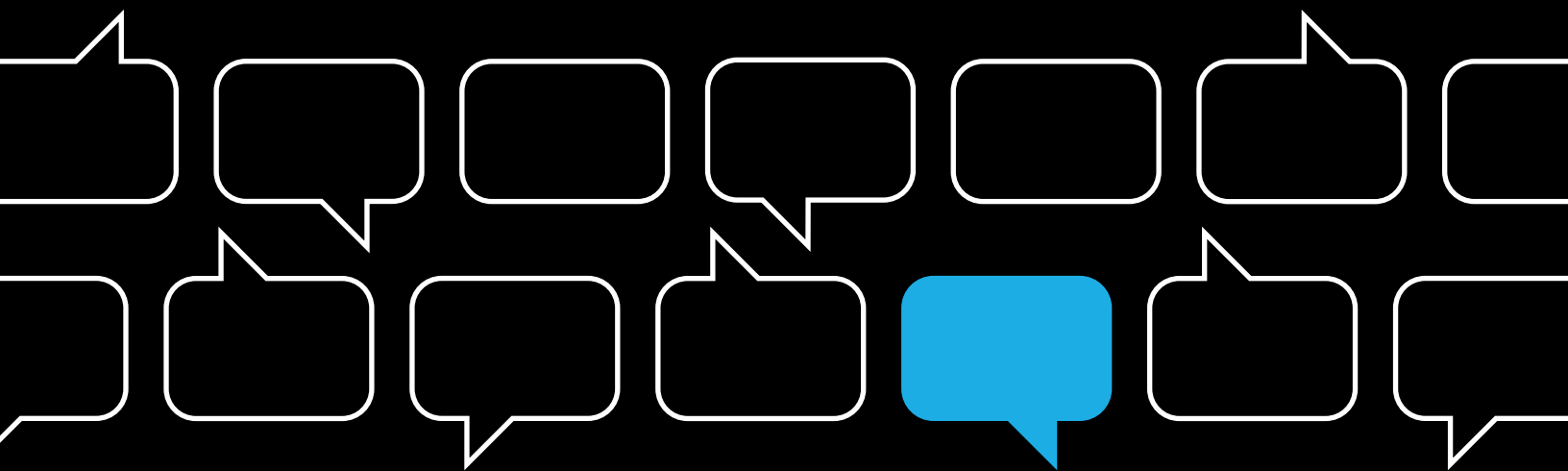
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rooms, where classes could connect to each other using "codecs." (Individuals did not have this capability on their home computers, however, since those were desktop setups, with slow components.) This was the first opportunity to connect face-to-face groups together via video over the internet. It was "point-to-point" in nature, but two or more face-to-face classrooms were able to connect with each other. There was no fancy term to describe this: just "videoconferencing in education" or "synchronous distance education." One example of classrooms connecting in this way was the Rural Advanced Community of Learners (RACOL) in Alberta, Canada.[2]

In the mid-2000s, the next leap that occurred was major: new software enabled personal laptops or desktops to connect directly to room-based videoconferencing systems. Where there was strong and stable internet available, this allowed individuals anywhere in the world to connect to videoconference rooms, transforming them more fully into *video-enabled classrooms*. The point-to-point leash had been broken, and the possibilities were limitless for merging modes for learning and including groups on campus, remote groups, and dispersed remote individuals. The merging of modes had now become enmeshed. The challenge was describing it—to administrators, to learners, and in the research literature. The result of the merged modes was not face-to-face or online learning. It also was not blended (hybrid) learning. The result was a combination, with varying mixes of who controls the modality.
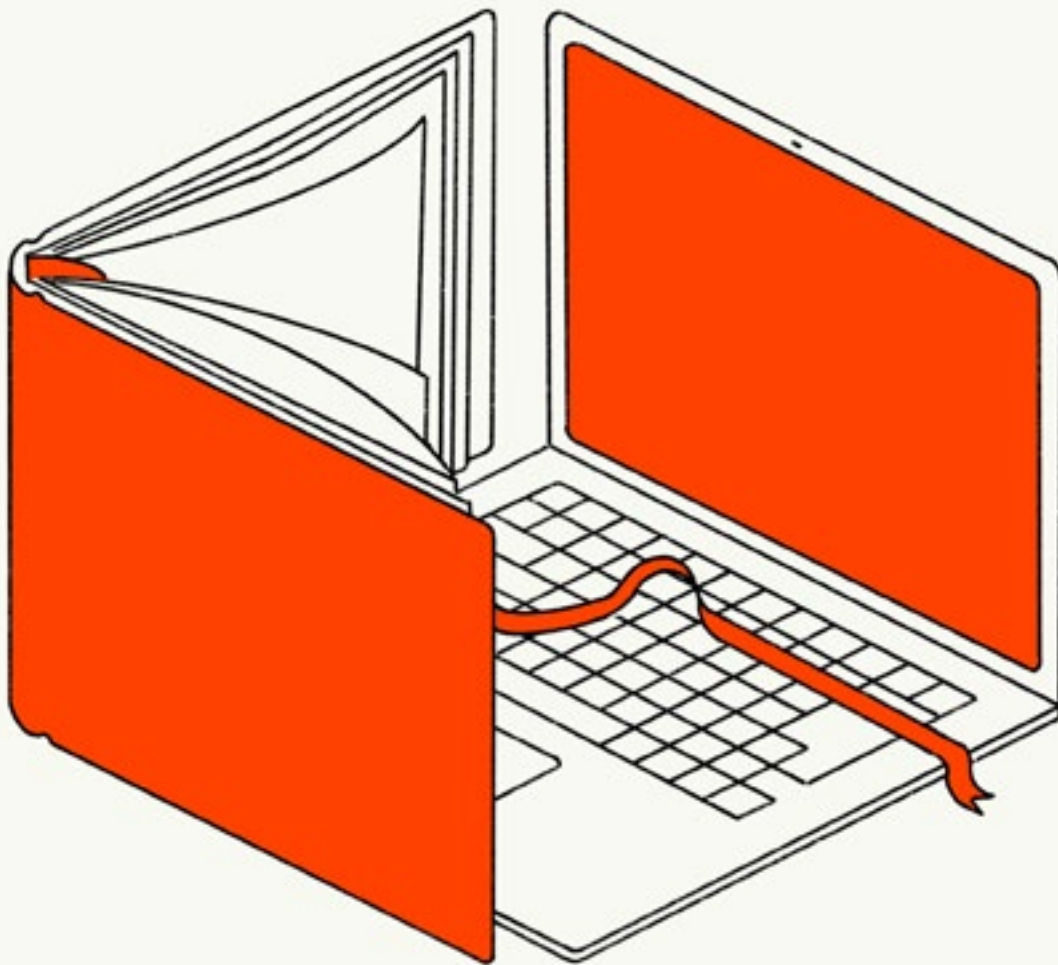
## Merging Modality Terminology

New terms emerged in the late 2000s to try to capture the phenomenon of the merging modes. Table 1 presents a matrix to provide an overview of four main terms. Note that this is a "best effort" and exceptions may exist.

The *HyFlex* (hybrid-flexible) model was developed by Brian Beatty in his graduate courses at San Francisco State University and introduced at the 2007 Annual Convention of the Association for Educational Communications and Technology. Beatty described the model as a combination of hybrid, which we know as combining both online and face-to-face modalities, and flexible, where "students may choose whether or not to attend face-to-face sessions."[3] The specific characteristic here is that the learners have full control of their modality (face-to-face, online synchronous, or online asynchronous), which often is not the case in educational settings where modality is merged. This limits the applicability of the term in that it cannot be applied to courses where synchronous attendance is required. It also cannot be applied to programs where the number of learners who can participate in person or online synchronously is limited or where there is no robust asynchronous option provided at all. HyFlex has gained significant attention beyond the research literature in response to the COVID-19 impact on campuses; however, it is likely that many of the implementations are not, in fact, true HyFlex designs.

> **HyFlex has gained significant attention beyond the research literature in response to the COVID-19 impact on campuses;** however, it is likely that many of the implementations are not, in fact, true HyFlex designs.
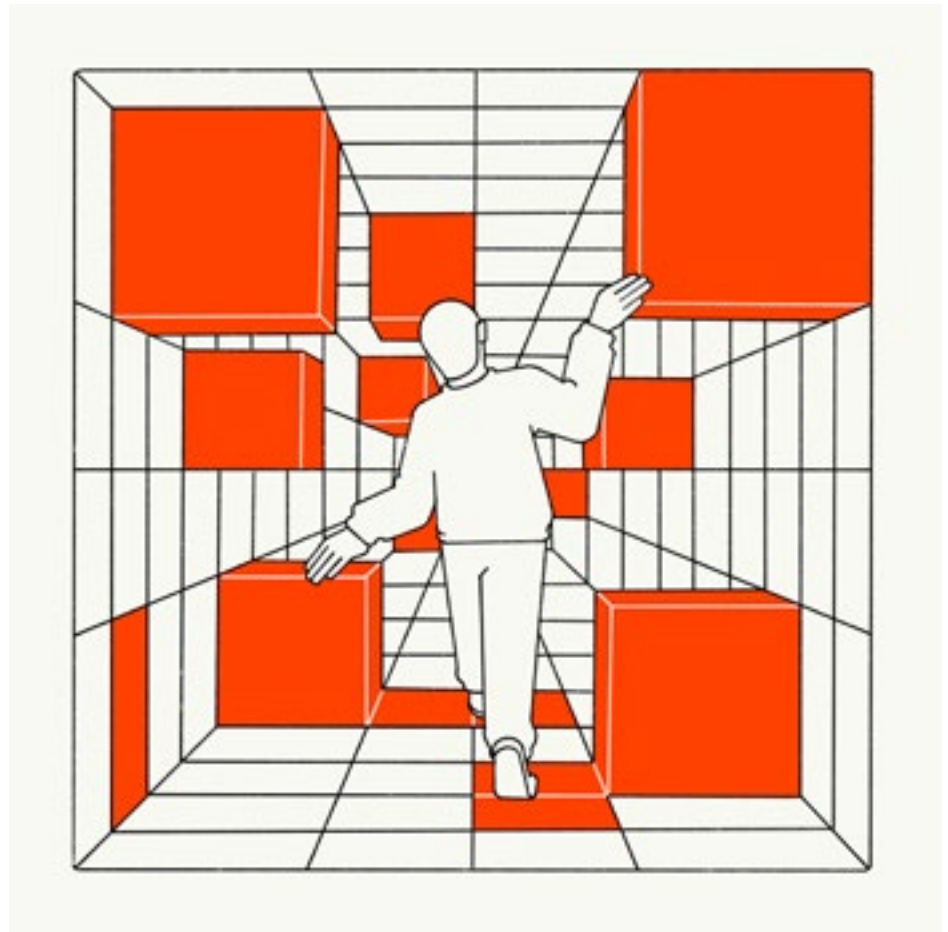
Table 1. Merging Modality Models

	f2f	synchronous concurrent	synchronous consecutive	asynchronous consecutive	open access
Blended (Hybrid)	X		X^	X^	
HyFlex	X*	X*		X*	
Multi-Access	X^	X^	X^	X^	X^
Blended Synchronous (Synchronous Hybrid)	X*	X*			

Note: Asterisk (*) designates where learners have the option to swap between modes. Caret (^) designates where modality or access options exist for learners and may provide options to swap between modes but are dependent on design.

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In 2006, with support from the Canada Foundation for Innovation, I developed *Multi-Access* learning. I introduced the model at the 2009 AACE EdMedia Conference and then expanded on the idea in a 2013 article.[4] Four levels of access are identified: (1) face-to-face, (2) synchronous online, (3) asynchronous online, and (4) open access. While the first three are modalities, the fourth is concerned with open access to course materials and/or discourse. Full choice of modality or inclusion of open access is recognized as not always being possible to implement. For example, one university decided to offer a course with concurrent synchronous online and face-to-face levels of access, with attendance being a requirement and some (limited) asynchronous activities, and with no open access to materials and discourse. Multi-access learning can also embed blended designs, whereby the synchronous instructional hours merging F2F and synchronous online are reduced in favor of asynchronous activities or decentralized synchronous learning "pods," which are small groups of learners who are expected to meet synchronously for discourse, peer assessment, and social support at a mutually agreed upon time each week. The Multi-Access learning framework puts *value* on increasing modality access but recognizes that contextual circumstances often require customizations and limits. The open-access level is added as a different type of access to encourage the involvement of open learners and a reconsideration of locking resources behind a password-protected learning management system or copyrighting materials—not unlike the rationale supporting open-access research.

Multi-Access learning has been recognized as an overarching framework that can broadly incorporate many different configurations of merging modes. How the configurations differ will ultimately depend on the contexts. Thus, HyFlex is a type of Multi-Access, but Multi-Access is not necessarily HyFlex, due to the fact that HyFlex specifies that the learner has the power to choose any modality. More Multi-Access designs have emerged as well, such as Blended Synchronous and Synchronous Hybrid (see below).

Blended Synchronous was proposed in 2013 by an Australian team led by Matt Bower (Macquarie University) and including Jacqueline Kenney (Macquarie University), Barney Dalgarno (Charles Sturt University), and Gregor E. Kennedy (University of Melbourne). The team expanded to include Mark J. W. Lee (Charles Sturt University) and published a handbook that included seven case studies spanning web conferencing, desktop videoconferencing, virtual worlds, and more.[5] The team defines Blended Synchronous as "learning and teaching where remote students participate in face-to-face classes by means of rich-media synchronous technologies such as video conferencing, web conferencing, or virtual worlds."

Another term for this same concept, *Synchronous Hybrid,* first emerged in 2014 as *Synchromodal,* conceived by John Bell, Sandra Sawaya, and William Cain (University of Michigan). Defined as classes where "online and face-to-face students interact during shared synchronous sessions," the term was rebranded in 2015 at a conference symposium as Synchronous Hybrid, which has since been used in applied studies.[6] Like Blended Synchronous, Synchronous Hybrid focuses on merging face-to-face and online synchronous learning environments.

One might question how it would be possible to teach synchronously online without asynchronous learning being part of the design; however, asynchronous communication requires more monitoring and digital literacy than synchronous-only classes. It is still not uncommon to have "radio silence" between traditional face-to-face courses with the standard "office hours," so these approaches can sometimes linger with shifts to mixing modalities. There
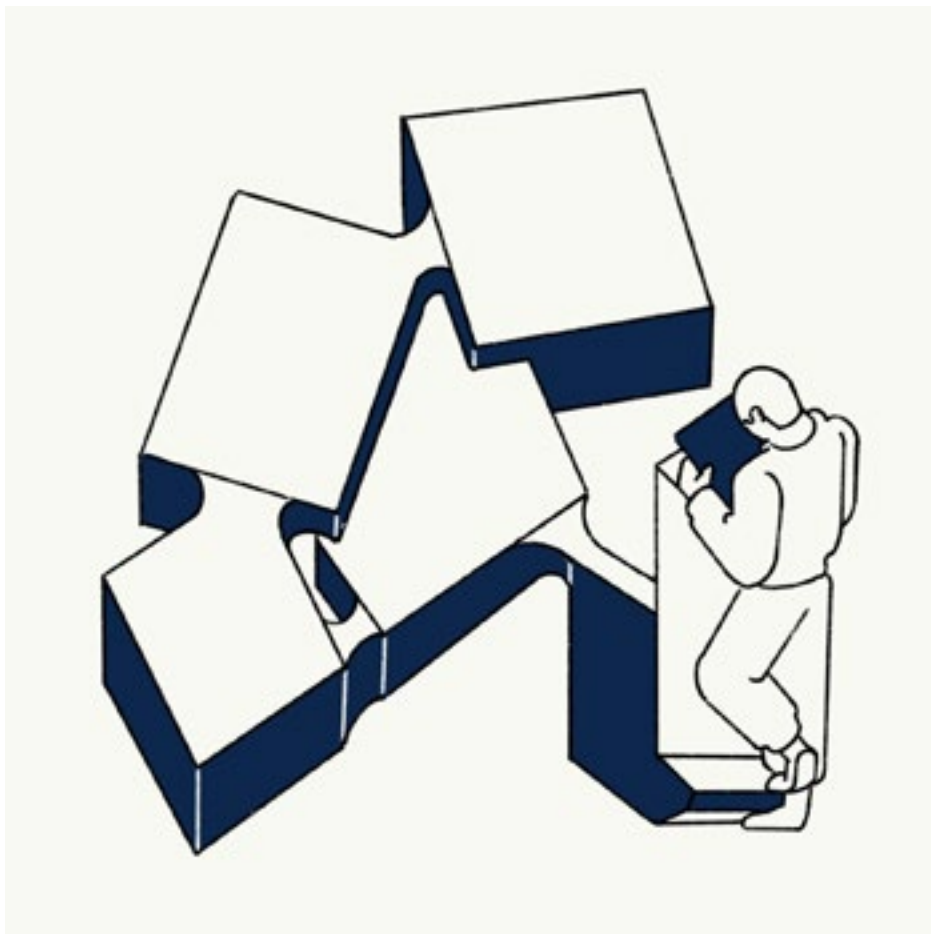
are significant opportunities available for resource sharing and discourse with asynchronous communication channels, and these typically are a centerpiece in many courses that merge modalities. Those new to teaching online in general may also prefer the synchronous-only design, so as to minimize the workload creep that comes with robust asynchronous communication—especially if they are already committing significant professional learning time to engaging in synchronous online designs. To address this, designs should consider not only mixing modalities but also reducing synchronous instructional hours to create time for asynchronous activities and dialogue. Regardless of institutional or instructor plans for learner communication—whether synchronous or asynchronous—many learners in a course will develop their own private back-channel spaces to support learner-only asynchronous peer-to-peer communication. Instructors may feel they are missing out on some discourse—and that is because they are.

Embedded in the synchronous designs for merging modes is the lesser-known integration of *telepresence robots.* Learners participate within a face-to-face class by connecting via audio and video with a telepresence robot, which can be table-top (stationary with pivot) or mobile. In the latter case, the remote learner can drive the robot around the room or beyond, so long as there is wireless internet (or, in some cases, data networks) for connection.

Lesser-known terms used to describe merging modalities have surfaced as well, although they have not been cited to the same extent in the research literature as the ones presented above. At the time this article was written, those citation numbers were as follows: HyFlex (34), Multi-Access (155), Blended Synchronous (206), Synchronous Hybrid (18), and Synchromodal (48). The lesser-known terms include *Converged Learning* (dating back to 1998), *Mode Neutral, BlendFlex, Comodal, Trimodal, Flex-Learning,* and *gxLearning.* Undoubtedly there are more.

Unfortunately, the shift away from the face-to-face/online binary has presented us with less shared understanding or, at best, muddied waters. Some of the terms created in response to today's emphasis on modality in education are especially complicated.

Struggles with Semantics

Semantics is a branch of linguistics and logic with a focus on the meaning of words. It is a critical tool in supporting our ability to communicate a shared understanding of our lived experiences. Like many things today, shifts from old-fashioned binary thinking have resulted in improvements in how we understand each other in society. Unfortunately, the shift away from the face-to-face/online binary has presented us with less shared understanding or, at best, muddied waters. Some of the terms created in response to today's emphasis on modality in education are especially complicated.

Remote Teaching or *Emergency Remote Teaching* emerged as a result of COVID-19 due to the concern that hastily prepared practices developed by instructors lacking knowledge and experience in trying to meet learners' needs online would generate negative perceptions of online learning, which has had decades to evolve. The distinction is important to highlight so that criticisms of emergency remote teaching practices—especially from educators who may have low digital literacy levels—are not generalized to online learning as a whole.[7]

Online Learning is one of the terms whose meaning has become unclear over time. The semantics have been muddied by technological advancement. In the early days, Online Learning referred to text-based, asynchronous "anytime-anyplace-anywhere" courses. Today, trying to understand the commitments required and/or agency provided in taking an online course is much more complex. Taking a course online may now require time commitments for engaging in synchronous classes—or not. Some classes may operate synchronously with little-to-no asynchronous components, which can often be the case for novice instructors pivoting to remote teaching. Attendance may be a requirement by the instructor, by the program, and/or perhaps even by certifying

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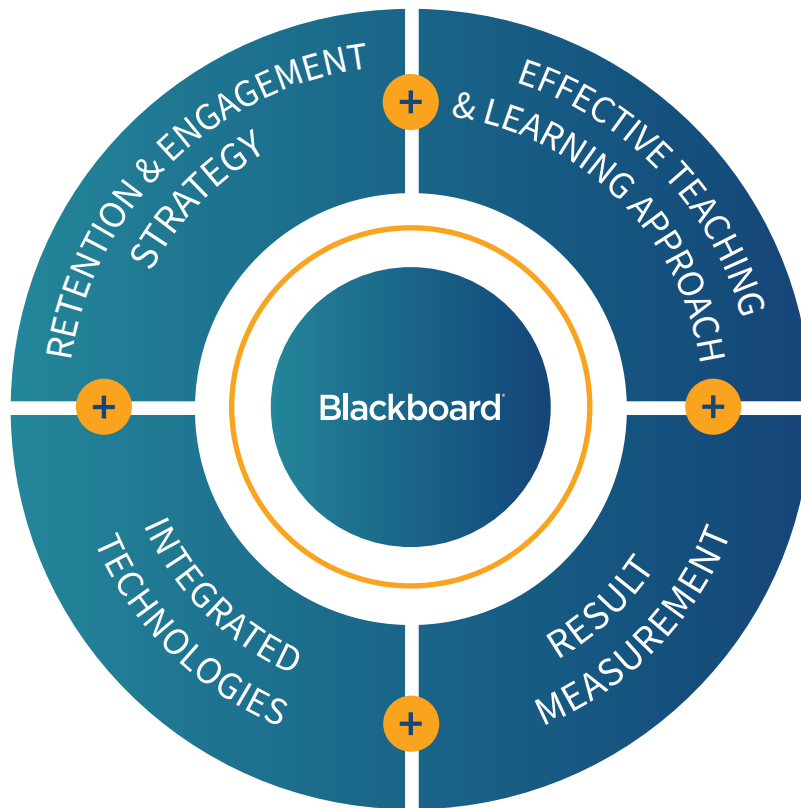
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bodies. Higher education institutions offering courses today must do more to communicate course offerings and their modality to potential learners up front and may be required to do so more than once, to ensure comprehension. This also involves more explicit and intentional learning designs to address how to interweave modality, pedagogy, and access in a course or program.

Let's do an exercise: imagine you are about to enroll in a course or program and are exploring the institution's website to determine your commitments. If a program states that it is offered "online," with no further description, what do you expect? Next, what do you expect if you see mentions of "blended learning" or "hybrid learning?" For example, the following passage was posted on the website for a Tier 1 university program to describe what learners can expect in terms of modality: "Program Delivery: The cohort will include face-to-face instruction in courses taught in a centrally-located [city] site and flexible, blended formats that mix on-site and online learning."

Even for those working in modality studies, this description is not clear, so one can assume the target learners will be confused. *Flexible* is a subjective term and can be relative to various contexts. Flexible could mean one has full choice of modality and can move back and forth, much as with HyFlex. For the "blended format," what is the required participation in both the on-site learning and the online learning: concurrent as in blended

synchronous? consecutive? What do they mean by "online learning": asynchronous? synchronous? Do learners have full control over mode, or must they pick their mode: on-site? synchronous? online? Must they then commit to that mode due to room size? Are there particular modality participation requirements that are expected of them? If you are new to the scene of online learning and are confused by the terminology, it's not just you.

Hybrid Learning has gained amplification currently due to the COVID-19 pivot. Unfortunately, this term is also creating confusion as it has been rebranded, in some cases, for merging modalities. Articles in both professional and popular media are using the term interchangeably to apply to both *consecutive* and *concurrent* modality mixing. If the historical interpretations of Hybrid Learning have focused on consecutive modality mixing (requiring learner participation in both face-to-face and online components), and the new emerging uses imply concurrent modality mixing (merging both on-campus and online learners synchronously), thus widening the meaning of Hybrid Learning, this can be very problematic for a common understanding. Since this sends us back to writing paragraph-long passages to describe our course offerings, use of the term Hybrid Learning is discouraged.

All the new terms that have been introduced are attempts by the community (both academic and professional) to filter out and find each other's work in order to advance knowledge and practice with merging modalities. But if all mixes of online learning are considered either blended or hybrid, we risk the progress that results from sharing common terms and understandings. In a recent search in the University of Victoria Library Summons, the terms Hybrid Learning and Blended Learning had more than half a million hits combined. Hybrid Learning alone resulted in almost 400,000. It's fairly obvious that many of the various designs discussed are embedded (or hidden) in these results.

Pedagogy vs. Modality

One persistent issue around modality in higher education is the bias arising from linkages made between pedagogy and modality, even though these are distinctly separate constructs. For example, online learning is often accused of being passive, and face-to-face learning is described as being dynamic. However, large, lecture-based, on-campus courses can also be passive, and small, online seminar courses can be dynamic and engaging. *Whether a learning experience is passive*
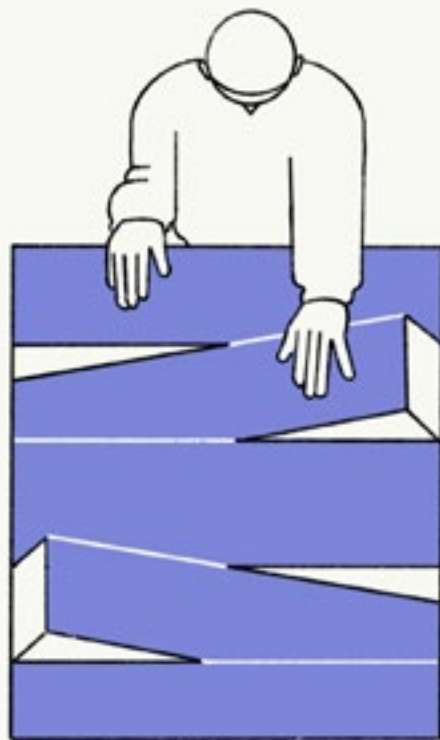
or dynamic depends on the pedagogy applied in the modality. Most of the terms reviewed for merging modalities are pedagogy-agnostic, meaning that their definition refers only to the modality applied. Although some integrate both modality and pedagogy, this makes their applicability best in specific contexts. In particular, the following three terms are often linked to modality but are more appropriately understood as pedagogy-related: Flexible Learning, Flipped Learning, and Inquiry-Based Learning.

Flexible Learning is a term that is more of a principle or pedagogical practice than a modality. Betty Collis and Jef Moonen describe Flexible Learning as having "many dimensions, only one of which is related to location of participants." They introduce its four components: technology, pedagogy, implementation strategies, and institutional framework. Their definition of Flexible Learning is broad and does not necessarily equate with distance education, but their key

The concept of Flipped Learning, in which content is learned before class through recordings or other resources, was initially designed with face-to-face courses in mind. But this pedagogical approach can also be applied in online courses, where the asynchronous time is used for reviewing resources and the synchronous time is used for discussion.
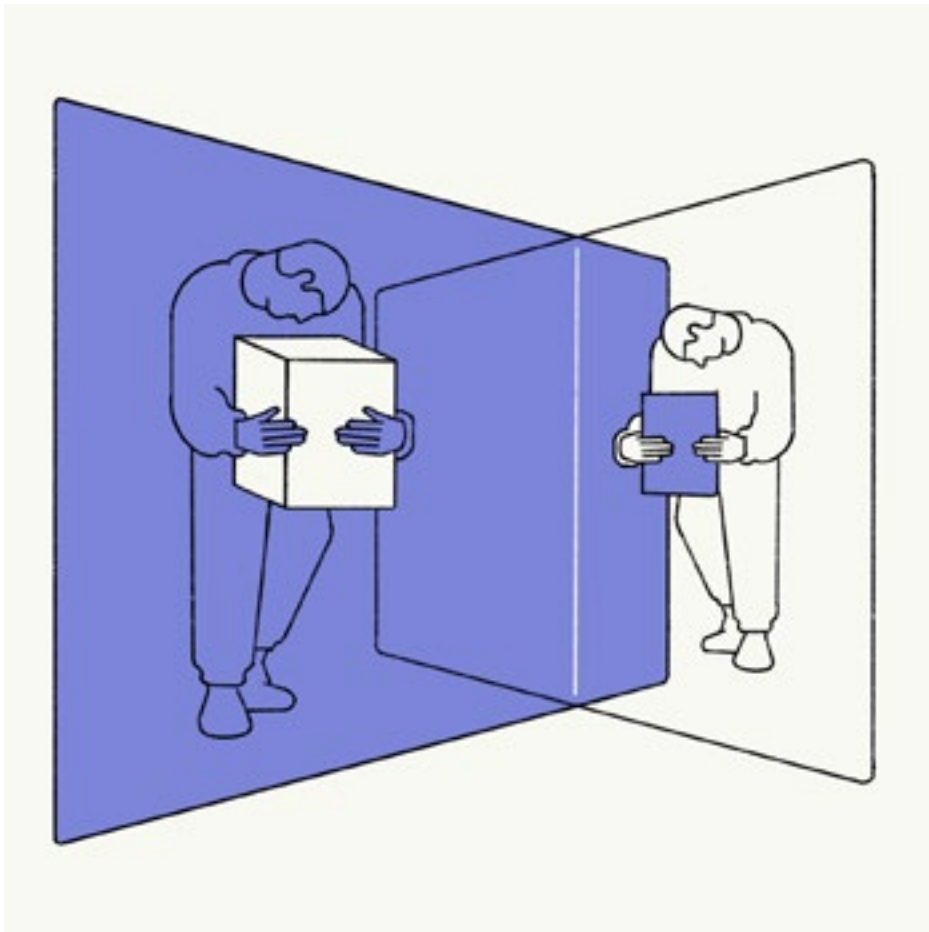
idea centers on "learner choice in different aspects of the learning experience," while recognizing that not everything flexible can be scalable.[8] This term and the historical work around it should be understood as merging modalities are explored, since the ultimate design goal of Flexible Learning is to increase flexibility and choice for the learner.

Flipped Learning is often considered a modality-related term, since online time outside of class is implicit in its design, but it is more of a pedagogical approach (and one could argue that reading a book chapter before a class in the 1970s is an example of flipped learning). The term *flip* emerged in a conference presentation by J. Wesley Baker in 2000 and was later expanded upon by Jonathan Bergmann and Aaron Sams.[9] The concept of Flipped Learning, in which content is learned before class through recordings or other resources, was initially designed with face-to-face courses in mind. This pedagogical approach can also be applied in online courses, where the asynchronous time is used for reviewing resources and the synchronous time is

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used for discussion. Ultimately, this concept is about pedagogy.

Inquiry-Based Learning has various interpretations but typically involves increased learner agency. Ultimately, learning happens where the learner is. With the growing recognition of the importance of learner voice and agency, designs ultimately shift to creating time and space for independent activities, as opposed to more structured, controlled, or guided inquiry that may be more directly connected to a classroom. As a result, there is more overlap between learner-centered pedagogies and shifts away from fixed, classroom-centric, face-to-face designs. A learner may not even be "online" per se but may be at home, in the community, in nature, or in some similar type of experiential learning but may be placed in the online category since that is the only option presented as an alternative to face-to-face. Shifts to inquiry-based learning and similar learner-centered designs are making a significant impact in the K-12 sector, but have yet to dominate the postsecondary sector.
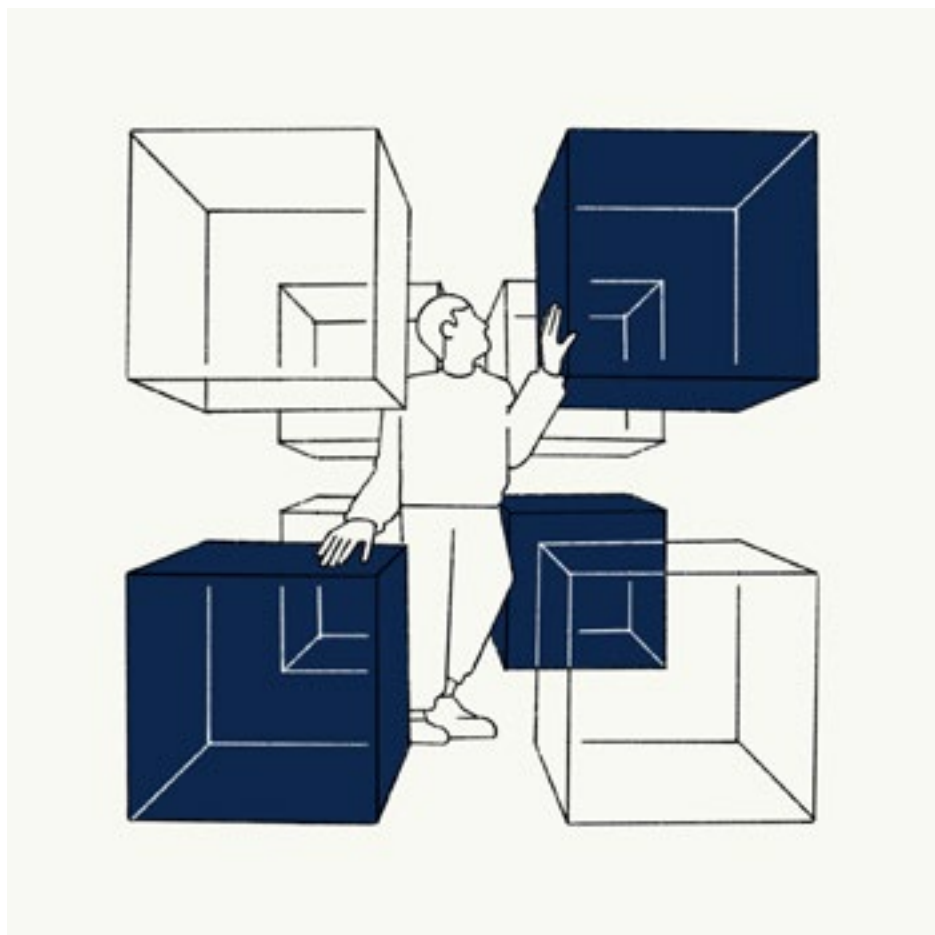
Pedagogy and Open Access

The terminology surrounding open access in education is similarly complex. It was, again, a simpler time when I started teaching online and open-access courses back in 1998. We just "did" open, and it did not have a label back then. Unfortunately, the open landscape is now as murky as the modality landscape. David Wiley states:

> I'm convinced that the terms "open pedagogy" and "open educational practices" are understood so differently by so many people that there is literally no hope of achieving a useful consensus about the meaning of either of these terms. Some definitions are centered on OER [open educational resources]. Some are centered on the public, linkable nature of the "open web." Some are centered on social justice. Some are centered on collaboration. Some are centered on innovation. Some are centered on learner empowerment. Some are exercises in the permutations of these. There have even been arguments made that a clear definition would somehow be antithetical to the ideal of open.

Wanting to find a new phrase that he could fill with his own meaning, Wiley created "OER-enabled pedagogy," which he defined as "the set of teaching and learning practices only possible or practical when you have permission to engage in the 5R activities"—Reuse, Revise, Remix, Redistribute, and Retain.[10]

The problem with "open pedagogy" is that it is portrayed as a rich, constructivist, learner-driven design. This ultimately reveals a positivity bias, since pedagogy is neither passive nor dynamic and remains to be defined by its design. A traditional xMOOC with videos and pop-up quizzes, for example, is didactic and yet open and therefore is problematic to be considered as open pedagogy if the term assumes a dynamic design. Wiley provides a solution for this within the use of his term, OER-enabled pedagogy, whereby the "type" of pedagogy can be listed to aid clarity, such as "OER-enabled constructionist pedagogy."

At the least, for any type of online pedagogy to experience positivity bias is a welcome change, considering that it has suffered negativity bias for so many decades. However, I prefer to avoid bias and favor using "OER-enabled pedagogy" or reclaiming the meaning of open.

Conclusion

In a time of significant shifts to online learning in a variety of configurations, we should try to utilize common terminology to describe our intended designs and practices. This is an exciting time to re-create how we teach, but in our drive to redefine ourselves, we need to be careful not to overstep in redefining terms that have been cemented in our present and past. We must focus on the meaning of our words in order to create a shared understanding for the future of our academic discourse, our professional practice, and our learners. ■

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Valerie Irvine is Assistant Professor, Educational Technology, and Co-Director of the Technology Integration and Evaluation (TIE) Research Lab at the University of Victoria.

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The 2020 EDUCAUSE Leadership Award recognizes John "Jack" Suess, Vice President of Information Technology and Chief Information Officer at the University of Maryland Baltimore County (UMBC), for his servant leadership at UMBC, his trailblazing contributions to IT research, and the enduring impact he has had on the higher education IT community.

JACK SUESS

For modeling selfless leadership and commitment to innovation and creative problem-solving; for advancing research and scholarship in the areas of advanced networks, cybersecurity, identity management, analytics, and technology standards for learning technologies; for creating a culture of collaboration and opportunity among faculty, staff, students, and other stakeholders in the higher education IT community; for demonstrating commitment to diversity, equity, and inclusion

Jack has served the UMBC community his entire career, starting in 1978 as a student employee in the university's computer center and becoming a staff member in Academic Computing in 1981. In 1997, he was tapped to lead the UMBC central IT unit. In 2000, he was named CIO, and in 2005 he was appointed Vice President and CIO. Jack has led or been involved in almost every major UMBC technology initiative that has supported advanced research, teaching and learning, administrative systems, or technology furthering student success. Along the way, he has held roles as a systems programmer, project manager, research collaborator, and part-time instructor. Throughout his career at UMBC, Jack has leveraged technology and analytics to expand the use of IT services and technology in teaching, learning, administration, and academic research.

His national contributions include the field of networking: in 1986 he led the effort to connect UMBC to the internet as part of the National Science Foundation Network (NSFNET), and in 1998 he was Principal Investigator for UMBC's connection to the NSF's very-high-performance Backbone Network Service (vBNS). In the field of identity management, Jack led UMBC's participation as an Internet2 middleware early adopter in 2000, and he served as the higher education representative on the NIST National Strategy for Trusted Identities in Cyberspace (NSTIC) from 2012 to 2017. In recent years, he has worked to expand the university's cyberinfrastructure in high-performance computing, storage, and visualization, serving as Principal Investigator on UMBC's NSF Cyberinfrastructure award in 2014, and has been one of the leaders supporting national efforts in advancing the use of learning analytics for student success.

Jack is a strong collaborator who works quietly behind the scenes to build consensus. Across every project, initiative, and technology implementation, his overarching concern is the impact of technology on faculty, staff, and students. In recognition of his strong commitment to diversity, equity, and inclusion (DEI), Jack

was appointed to the inaugural board of the Center for Women in Technology at UMBC in 1998. More recently, Jack and his team have become a model in diversifying the student workforce at UMBC.

Jack is the author or co-author of two book chapters and numerous journal and magazine articles, blog posts, and other publications. He has delivered more than seventy presentations and webinars on topics including teaching and learning, student success, MOOCs, data governance, identity management, analytics, cloud services, IT culture, and IT leadership. Jack has conducted research on fiber-optic networks, federated virtual desktops, data-intensive cyberinfrastructure, and network infrastructures supporting minority achievement in STEM. He received more than $1.7 million in contracts, grants, and sponsored research funding. He was the principal investigator (PI) on a 1997 National Science Foundation (NSF) grant to develop vBNS networking at UMBC and a 2014 NSF cyberinfrastructure grant to upgrade the network on his campus to 100 Gbits. He was co-PI on an NSF grant to increase the number of women working in information technology through improved access to global resources and a state grant for broadening the IT skills of college students across all majors.

Jack's service to EDUCAUSE spans twenty years. Among his many other contributions to the organization, Jack has served on the EDUCAUSE Board of Directors (as a member, vice-chair, and chair), the Higher Education Information Security Council (HEISC) (as a member and chair), the Network Policy Council, the Seminars on Academic Computing (SAC) Committee and SAC Board of Directors, the IT Issues Panel, the ECAR Working Groups Advisory Committee, and the EDUCAUSE Annual Meeting Program Committee (as a member and chair). He is currently a member of the EDUCAUSE Policy Advisory Committee and the Analytics Services Design Panel (ASDP) and is a frequent contributor to *EDUCAUSE Review*.

Nationally, Jack has served, or is presently serving, on the boards of Internet2, IMS Global, REN-ISAC, and the NIST National Strategy for Trusted Identities in Cyberspace.

In 2004, Jack was selected for the UMBC Presidential Leadership Award, the highest recognition the university bestows on staff members. He was named UMBC Alumni Volunteer of the Year in 2000 and received the Internet2 Presidential Leadership Award in 2011.

Jack stands out not only because of the work he has done but also because of his investment in others. He is a thoughtful and honest mentor, an inquisitive researcher, and a groundbreaking innovator. He has dedicated his career to seeking the best path forward for his staff, his university, and the broader higher education IT community. Jack Suess exemplifies what it means to be an inspirational leader in higher education.

2020 EDUCAUSE
Community Leadership Award

HILARY J. BAKER

For demonstrating innovative and exceptional thought leadership in and across higher education institutions; for modeling the values of inclusiveness, integrity, and personal commitment in service to the community and the profession; for fostering collaborative and supportive environments and mentorship among IT professionals to develop the potential of future leaders in higher education

The 2020 EDUCAUSE Community Leadership Award recognizes Hilary J. Baker, Vice President for Information Technology and CIO Emeritus at California State University, Northridge (CSUN), for her tireless and unwavering commitment to building community and advancing the higher ed IT profession through her exceptional leadership, mentorship, and dedicated service.

Throughout her career, Hilary has been a champion in helping IT organizations to implement sound planning and innovative service models to support their campus communities. As Senior Director of IT Services at the California State University Office of the Chancellor, she effectively worked across boundaries to lead system-wide planning, design, and implementation of an ERP administrative systems project for the system's 23 campuses—the largest project of its kind in higher education at that time. Later, at CSUN, she was responsible for shaping the overall direction and vision for information technology at the university, including implementing *CSUN Technology Vision 2022*, a university-wide strategic plan to leverage technology and create a more digitally enabled institution in support of student success. During her tenure at CSUN, she also led several innovative and award-winning technology projects, including student competitions with virtual/augmented reality and artificial intelligence themes, a student/faculty tablet initiative, and an AI-powered CSUN chatbot.

In addition to furthering higher education by exploring and implementing new technology initiatives, Hilary also has a natural ability to identify future leaders and to foster talent by providing a positive learning environment in which people can grow professionally. She not only generously supported and mentored emerging leaders but also challenged her direct reports to help identify organizational staff with the aptitude and potential to grow their responsibilities.

At the time of her retirement in December 2019, Hilary was a member of the EDUCAUSE Board of Directors, having served in that role since 2017. During her service on the board, Hilary and EDUCAUSE President and CEO John O'Brien spearheaded the work of the International Task Force to facilitate opportunities for

collaboration, increase interaction and sharing, and learn how EDUCAUSE could best serve the association's non-US members. Hilary served on the EDUCAUSE Annual Conference Program Committee several times, including acting as Chair in 2004. She participated as a member of the Recognition Committee, and she has served as a faculty member for several EDUCAUSE Institute programs. Beyond her committee and faculty service, she has been a frequent presenter on leadership and a variety of other topics at EDU-CAUSE conferences.

Hilary also served as Vice Chair of the Los Angeles Chamber of Commerce Innovation and Technology Council and has been a member of the Oracle Education & Research Industry Strategy Council and the Salesforce Higher Education CIO Council. She previously served on the PeopleSoft Higher Education User Group Board and the Northridge Hospital Community Board and is an alum of the 2004 Leadership California Program for California women executives. In 2017, she was the recognized with an Outstanding Executive in Technology Award from the Advancing Women in Technology organization.

In addition to furthering higher education by exploring and implementing new technology initiatives, Hilary also has a natural ability to identify future leaders and to foster talent by providing a positive learning environment in which people can grow professionally.

Hilary embodies the community leadership qualities most valued in the higher ed IT profession. The impact she had on those fortunate enough to have worked with her is unparalleled. Her ability to create environments that encourage professional growth and potential and her dedication to the success and advancement of others, particularly women in the IT field, have made Hilary J. Baker an empowering force for all those she has helped and inspired in their own professional journeys.

2020 EDUCAUSE
DEI Leadership Award

The **2020 EDUCAUSE DEI Leadership Award** recognizes Deborah Keyek-Franssen, Associate Vice President and Dean of Online and Continuing Education at the University of Utah, for her dynamic and visionary leadership to promote positive relationships between the academy and the IT community and for her research and advocacy in support of diversity, equity, and inclusion (DEI) across the IT practice.

DEBORAH KEYEK-FRANSSEN

For building a culture of inclusion, engagement, and improvement across the higher ed IT profession; for providing creative and visionary leadership, training, and support to help IT professionals advance in their careers; for offering mentorship and being an exceptional role model for what it means to lead through service

Throughout her career, Deb has understood the need to increase diversity in higher education information technology, to ensure inclusive environments for IT staff, and to advocate for the technology tools and practices that would promote equity, especially among students. As Associate Vice President, Digital Education & Engagement, at the University of Colorado (CU) System, she was instrumental in convening leaders and practitioners from the CU System's four campuses and creating intentionally collaborative efforts to explore innovation in teaching and learning with technology.

Deb's work portfolio is characterized by her deep commitment to DEI. She has actively promoted programs designed to encourage and support women in their choice of information technology as a profession. As co-director of the Colorado Coalition for Gender and IT, she led a statewide nonprofit coalition of education, industry, and government representatives to increase participation of girls and women working in and studying technology. In this role, she secured grant funding directed to research

projects at and for community colleges and worked with area computer science departments to promote educational and work opportunities as part of a military spouses' initiative. She has offered workshops on effective DEI practices in the recruitment, retention, and advancement of underrepresented groups and on training to help professionals in academic and technology sectors identify and interrupt implicit bias.

Among her many contributions to EDUCAUSE, Deb served on the DEI Task Force, which launched DEI as a strategic priority for the association and led to the creation of the *CIO's Commitment on Diversity, Equity,*

and Inclusion. In 2009, she co-founded the EDUCAUSE Women in IT Community Group and served as co-chair of the group through 2016. The gatherings of this group at annual conferences attracted hundreds of attendees, and Deb and her co-founder, Beth Schaefer, used innovative techniques (e.g., improvisational theater and carousel discussions) to engage participants in a commitment to behaviors that would increase DEI on their home campuses. She has served as a faculty member for the EDUCAUSE Management Institute, where she taught interactive sessions on DEI, negotiation, and career development. She has presented frequently at EDUCAUSE events and has written articles on a variety of subjects for *EDUCAUSE Review.*

Beyond her service to the EDUCAUSE community, Deb has an extensive portfolio of advocating for DEI, open educational resources, and student success and STEM initiatives in the higher education IT community, both nationally and internationally. She has been a frequent speaker on building diverse and inclusive organizations, presenting invited keynotes for conferences sponsored by the National Association of System Heads, the National Center for Women and IT, and the Colorado Women's Education Foundation. She has been an instructor at the University of Colorado Boulder and an adjunct professor at the University of Denver, where she has taught courses on gender, race, and technology. She is a frequent blogger on DEI issues and guest-edited a Gender & IT issue of *Frontiers: A Journal of Women Studies.*

Building on her creativity, experience, commitment, and collaborative spirit, Deb has been a passionate advocate for greater awareness of DEI practices and resources. Deborah Keyek-Franssen is a role model for promoting opportunities and reducing barriers for underrepresented groups and has made a positive impact in leading the IT profession and higher education to become more diverse, equitable, and inclusive.

Deb has an extensive portfolio of advocating for DEI, open educational resources, and student success and STEM initiatives in the higher education IT community, both nationally and internationally.

2020 EDUCAUSE
Rising Star Award

SHANNON DUNN

For contributing to advances in instructional technology; for advocating for excellence in teaching and learning; for promoting student success; for championing diversity, equity, and inclusion; for being a supportive mentor and insightful leader

The 2020 EDUCAUSE Rising Star Award recognizes Shannon Dunn, Assistant Director at the University of Florida Information Technology (UFIT) Center for Instructional Technology and Training (CITT) for her exemplary growth and achievements in the areas of instructional design, educational technology, and staff leadership.

Since joining the University of Florida (UF) five years ago, Shannon has taken on increasing responsibility, moving from her role as an instructional designer at the CITT to her appointment as an Assistant Director in UFIT, managing instructional design and educational technology services and staff at the CITT. Shannon has been instrumental in expanding the role of instructional designers at UF. In addition to course-development services, UF instructional designers now offer teaching and technology consultations, training, and curriculum development services. Shannon has also implemented many technology-focused programs and services that have positively impacted the entire university. In 2017, she introduced a slate of instructional development workshops, including some of the university's first training modules for asynchronous instructors. In 2019, she led the inaugural UF Teaching TechXploration, an event aimed at educating faculty about the tools, academic technologies, and services available at UF and advising staff on how faculty would like to leverage technology in their courses. She has also cultivated communities of practice around augmented reality / virtual reality (AR/VR) and 3D scanning/photogrammetry.

Shannon actively promotes collaboration and inclusion across the organization. She not only facilitates meetings and workshops to improve teamwork within her unit but also encourages staff from the CITT to join committees and increase their representation. Among other things, she has encouraged CITT staff to participate in the LGBTQ+ Presidential Advisory Committee, the General Education Curriculum Committee, and the Provost's Student Success Task Force. Shannon has also championed training programs to help faculty improve the accessibility and inclusivity of their online courses.

Always willing to take on new responsibilities and challenges, Shannon has served on a variety of councils and committees at UF and has progressed into leadership appointments. She served on the new faculty orientation work group and currently serves on the Teaching Innovations Committee. She is co-chair of the Teaching with Technology Faculty Learning Community and chair of the multi-institution Learning Technology Consortium. Because of her experience in academia and insights into the needs of UF faculty, staff, and students, she was asked to lead development of the *UF Strategic Plan for IT 2020–2025.*

Shannon has championed significant innovation at UFIT while maintaining a focus on access and inclusion. At the same time, she has established herself as a gifted instructional designer, an excellent mentor, and a compassionate leader.

Shannon has demonstrated a commitment to mentorship, professional development, and service to EDUCAUSE. She completed the EDUCAUSE Learning Technology Leadership Program in 2018 and has served as a proposal reviewer for EDUCAUSE and the EDUCAUSE Learning Initiative (ELI). She has been a presenter at the ELI Annual Meeting and the EDUCAUSE Annual Conference and has encouraged her colleagues to do the same. Because of Shannon's recommendations and guidance, 80 percent of the instructional designers in the CITT have presented at an EDUCAUSE conference or completed an EDUCAUSE course or program. Indeed, one of the hallmarks of Shannon's leadership style is her dedication to building up those around her. She actively encourages staff members to seek out professional development opportunities and mentors women who are pursuing careers in academia. She also started an internship program for undergraduate students who are seeking experience in academic technology.

Shannon has championed significant innovation at UFIT while maintaining a focus on access and inclusion. At the same time, she has established herself as a gifted instructional designer, an excellent mentor, and a compassionate leader. Through her contributions to UF and EDUCAUSE, Shannon Dunn has distinguished herself as a rising star in the higher education IT community. ∎

Sustaining Advancements in the New Normal

Earlier **this year,** colleges and universities across the globe were disrupted like never before. Literally over a weekend, faculty and staff moved instruction and support services entirely online. In many cases, institutions were well positioned to conduct remote instruction and work. In other cases, institutions had no choice but to rapidly ramp up new digital services to support a host of instructional and administrative functions. In both cases, we learned that our colleges and universities are far more agile and resilient than we may have previously believed.

The question now is, how can we sustain this agility and resilience? How do we build on both the technology innovations and the technology adoptions as higher education institutions plan for resuming *normal* operations sometime in the future? How can we exploit the best outcomes of our pandemic responses to create the institutions needed for the future of education, workforce development, and research?

Five colleagues from community colleges around the United States share their plans for capturing the successes realized in their pandemic response and what they plan to do to sustain those advancements.

Kentucky Community and Technical College System
Jeremy Miller, Executive Director of Enterprise Architecture
Before COVID-19, the Kentucky Community and Technical College System (KCTCS) was well positioned to deliver remote instruction and support. Even so, the sudden shift to a fully online environment offered plenty of opportunities. The KCTCS Technology Solutions team rapidly looked for ways to ensure that students, faculty, and staff were able to remain successful under the existing conditions. Some of the solutions included fast tracking a software phone option and extending guest Wi-Fi into parking lots to aid those without adequate connectivity.

One challenge, though, was that this shift landed directly in the middle of a transition from an on-premises web conferencing solution to a more modern collaboration platform in Microsoft Teams. Understanding that virtual collaboration would be even more essential now and into the future, the KCTCS team made the decision to step on the gas and drive the original yearlong project to completion in just a few short months.

During the accelerated rollout, a couple of key points were highlighted. First, people are more adaptable than we think. While the team delivered as much training as possible, faculty and staff were able to transition to the new system and started to collaborate in ways unheard-of in the past. Second, the team members showcased their dedication to delivering quality solutions that can be successfully deployed even on a condensed timeline. The new collaborative skills learned will continue to benefit the KCTCS community as the institution braves whatever the future holds.

Tarrant County College
Carlos Morales, President, TCC Connect Campus
Tarrant County College (TCC) has six campuses serving approximately 100,000 students who transitioned to remote services—including teaching, learning, and student services—on March 20, 2020. The COVID-19 crisis disrupted the normal college functions that provide support for students. Fortunately, TCC was prepared with processes, technology, and infrastructure to support the conversion to remote functioning.

Process-wise, eight months before the pandemic, the college had approved an Academic Continuity Plan that set the foundation for a seamless shift.[1] One week before the cessation of the face-to-face operations, the virtual campus created Blackboard Essentials, a basic training guide made available to more than 1,500 faculty members to aid in the transition to remote teaching.[2] It covered the use of the learning management system (LMS), the publication of content, and the management of the virtual

classroom. Central to this plan is students' safety and preparedness, which are essential to their success. Therefore, students were surveyed regarding their access to a computer and the internet, resulting in the acquisition of more than 4,000 devices such as tablets, computers, and Wi-Fi hotspots.

Instructional design and multimedia services were provided to faculty to augment their teaching and help them stay in contact with students.[3] An analysis of the activities occurring in the LMS during the first thirty days of remote teaching by faculty resulted in more than 54,000 hours of technology-mediated delivery in 5,138 course sections.

TCC student services moved to remote function at an equal pace. The virtual campus, with its expertise and experience, led the effort to move academic advising entirely online. While the online advisors are based at the virtual campus, they served the entire college; the coronavirus emergency prompted the expansion of hours and a more finely tuned menu of services for students. On average, online advisors were assisting 550 students daily during the early days of the COVID-19 emergency. The myth that face-to-face advising and counseling transactions can be offered only via face-to-face channels is now dispelled because of the college's actions to provide these services remotely.

The college also extended its Online Instructor Certification (OIC)—mandatory training for faculty teaching 100 percent online courses—to all faculty in order to afford them more advanced strategies, professional development, and techniques to increase their success. In 2014, the virtual campus of the college had introduced Peer Developed Courses (PDC), created by a panel of faculty subject matter experts and infused with instructional design support, methods, and a revision process. For the Fall 2020 term, the six vice presidents of academic affairs promoted the adoption of these courses to accelerate and facilitate the transition of all faculty to online course delivery.

The college and its staff are more committed than ever to student success. The strategies employed during these past months have been of great benefit and have led to further improvements and operationalizations of initiatives and processes.

Montgomery County Community College
Celeste Schwartz, Chief Information Officer
The response by Montgomery County Community College (MCCC) to supporting a remote workforce and remote instruction was successful as a result

BEN ROBBINS/UNSPLASH

of both prior investments in digital transformation and an agile institutional culture. For the last several years, MCCC has focused on eliminating all paper processes. All student workflows have been converted to automated processes using the Frevvo platform, which is integrated with all major systems at MCCC and permits seamless digital experiences for students and staff. Processes such as course substitutions and change of major are remotely accessible through this platform.

Like many other higher education institutions, MCCC quickly deployed the Zoom platform not only to support academic instruction but also to facilitate campus-wide collaboration. MCCC's president, Vicki Bastecki-Perez, utilizes this platform regularly to host morning "Coffee and Conversation" meetings across the entire organization. Additionally, MCCC quickly acquired and distributed notebook computers to staff and students who needed them. Because of prior investments in a virtual public network and virtual application/desktop technologies, MCCC staff were able to access systems and resources for remotely supporting students. To acknowledge the elevated importance of student mental health during COVID-19, MCCC was the first community college in the United States to subscribe to the Talkspace service, which provides every student with mobile access to mental health counseling.

Although this is a difficult time to complete large-scale physical upgrades, MCCC stuck with its plans to migrate its web portal to the Campus App platform in early July. This platform focuses on digital student engagement through a social-web interface and companion mobile application—features especially useful during the pandemic.

We learned that our colleges and universities are far more agile and resilient than we may have previously believed. The question now is, how can we sustain this agility and resilience?

Milwaukee Area Technical College

Thomas Hausmann, Chief Information Officer

Milwaukee Area Technical College (MATC) rapidly delivered enhanced services for remote instruction during the pandemic. For example, before COVID-19, most instruction was conducted face-to-face. Approximately 16 percent of courses were taught mostly online before March 2020. MATC now anticipates that 68 percent of courses will be delivered entirely online or virtually in fall 2020 via Blackboard Ultra and Collaborate.

Multiple instructional technology initiatives contributed directly to supporting learning at a distance. MATC distributed 1,300 Chromebooks to students in the Spring 2020 term and plans to distribute another 1,500–2,200 Chromebooks in the Fall 2020 term. Remote computer lab access is managed via LabStats Remote Access Dashboard. LabStats Remote enables students with any browser-capable device to remotely connect to a campus-based workstation. Remote lab access is appealing for the continued use of the thousands of workstations in our district. MATC also deployed TechSmith Knowmia for instructional media enhancement. The Remind communication platform deployment for messaging and communications enables further faculty-student interaction. MATC expanded existing outdoor wireless internet access to district parking areas at multiple locations. In the fall of 2020, the MATC Library will offer a reserved circulation of more than 200 computers and 250 mobile hotspots for employees and students.

MATC also deployed an enhanced array of web-based and mobile-friendly services to students. Self-service student planning allows one-click registration, access to advising information, course search, unofficial transcript requests, and program completion scheduling. Our COVID-19 response accelerated the deployment of other self-service tools for financial aid, student finance, and payment processes. MATC uses G Suite, and employee-student interaction is supported by Google Chat.

MATC rapidly delivered a variety of information technologies, expanded current resources, and accelerated deployment of new services to support employees working from home. All employees have softphone capability on computers or cellphones via Cisco Jabber. Remarkably, college employees quickly and successfully pivoted to wide use of Google Meet as part of the COVID-19 response. MATC already had a substantial on-premises virtual desktop infrastructure (VDI). College IT personnel rapidly reconfigured and expanded the VDI infrastructure for increased use by employees and students. Further, when certain systems and services were not suitable for VDI access, VPN services were expanded to include additional campus groups.

New River Community and Technical College

David Ayersman, Chief Information Officer

New River Community and Technical College's recent investments in technology positioned it well for the unfortunate situation caused by the pandemic. In many ways, the pandemic revealed which services and information were simply not yet available to remote users and thus shifted the focus of the college on these areas for improvement.

The small IT staff at New River, responsible for a nine-county service region, was faced with making improvements in response to the pandemic. The college admissions and course registration processes needed only minor adjustments in order to be available completely online. Some services that were not previously prioritized highly quickly became essential for remote users. The college implemented AppointmentPlus for online scheduling for advisors and student support staff, adopted Zendesk as an online chatbot and virtual agent, and expanded licenses for Zoom to cover all instructors. The college also implemented online secure file exchanges and online faxing with XMedius. We have deployed more than forty Cisco IP Communicator virtual phones for remote users so that they can continue using office phone numbers remotely. New River has two primary in-state support partners, WVNET and Alpha Technologies, who have been instrumental in enabling the college to quickly implement new services, adjust existing services, and provide the additional support needed to meet dramatically increased demand. New River is also fortunate that just prior to the pandemic, the college had implemented Zoom college-wide as well as Ellucian Banner 9 upgrades, a new portal (PortalGuard), and a new emergency-alert communication system (Regroup).

New River Community and Technical College will sustain these efforts by shifting priorities. For example, rather than continuing to invest in on-campus computing resources where 25-seat computer labs are in spaces not conducive to social distancing, the college will shift its short-term goal to investing in the expansion of online services to meet the ongoing needs of remote learners and remote workers.

<center>*****</center>

The COVID-19 pandemic drove colleges and universities to rapidly refine processes that had once been considered sacrosanct. Although not all ideas were practical or readily scalable, higher education institutions learned to accelerate the adoption of new technologies for instruction and services. We must now sustain these advancements in the new normal. ∎

Notes
1. Carlos Morales, "The Role of Online Learning and the Implementation of Academic Continuity Plans: Preserving the Delivery of the Academy," in *Proceedings of the Hawai'i International Conference on Education*, Honolulu, 2020.
2. Charles B. Hodges, Stephanie Moore, Barbara B. Lockee, Torrey Trust, and M. Aaron Bond, "The Difference between Emergency Remote Teaching and Online Learning," *EDUCAUSE Review,* March 27, 2020.
3. Carlos Morales, "Driving Change: Implementing eLearning Faculty Support Services at Scale," *2019 Online Educa Berlin (OEB) Book of Abstracts.*

Joseph Moreau is Vice Chancellor of Technology and Chief Technology Officer at Foothill–De Anza Community College District. He served as Editor of the *Connections: Community College Insights* department of *EDUCAUSE Review* for both 2019 and 2020.

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Research Libraries, Emerging Technologies—and a Pandemic

Last October, the Association of Research Libraries (ARL), the Coalition for Networked Information (CNI), and EDUCAUSE partnered to explore how research libraries can leverage emerging technologies to meaningfully and productively support research and learning, given ongoing evolutions of digital tools and data collections. Even while we were working on the slippery task of identifying and predicting technologies and processes that could have big impacts on research library objectives, we did not anticipate that a pandemic with world-stopping power might be a scenario we should consider.

Pandemic Advice

Not long after the novel coronavirus reached US shores in late January 2020, my library, like most others in North America, closed, and staff dispersed to work remotely. We focused on doing as much of our work from home as possible and on providing support for students and faculty who had to suddenly shift the context for learning to an online model. With most labs closed, we grounded ourselves in whatever support for research continuity we could engineer. We now know enough about the virus to say that the next few years are uncharted and uncertain, and this uncertainty compounds financial and other strains on research libraries.

In the early days of the pandemic, I read some expert advice that stuck with me: people should prepare for pandemics by, among other things, ensuring that the essential functions of society are maintained. In a worst-case scenario, research libraries' functions that are not maintained could be difficult to restore when we've returned to some form of normalcy in the future. So the question is: Given what we've learned about promising emerging technologies, what approaches should research libraries take to maintain the most essential and valuable aspects of their work?

> **Given what we've learned about promising emerging technologies,** what approaches should research libraries take to maintain the most essential and valuable aspects of their work?

Five Findings to Steer By

By March/April 2020, the ARL-CNI-EDUCAUSE team had drafted two reports addressing our inquiry: a landscape of emerging technologies in research libraries; and a synthesis of interviews with experts on emerging technologies for research and learning.[1] We conducted workshops to help develop visions of achievable and desirable futures for research libraries, reporting the results in August 2020.[2] Of these findings, five are most helpful in our current circumstances: technological adoption; openness; collaboration; data and data infrastructure; and digital fluencies.

Technological Adoption

A guiding insight from the ARL-CNI-EDUCAUSE project is that technologies are adopted in social contexts that shape how they are used, for what, and by whom. The current circumstances are far different from the usual context for technological adoption, presenting both risks and benefits.

One potential benefit is that with so many people trying new tools (or new-to-them tools) at the same time, we have the ability to accrue feedback about what works and what does not, even if not via a controlled experiment. One risk is that nontechnical factors will give less beneficial technologies a boost just because they were what was available at a crucial moment. For example, in the rush to find a tool that helps solve a problem for online teaching, instructors may overlook important factors like data ownership, jeopardizing the ability of faculty and students to control their data.

Instructors are under new pressures in the labor-intensive process of designing and implementing effective online courses; shortcuts and burnout are two likely impacts. With labs closed and field sites off-limits, researchers will emphasize other phases in their research process, potentially seeking new sources of data and methods for analyzing that data.

Much of what research libraries already do, and hope to do, is ready-made for access over networks. But we should also anticipate technological trade-offs. Remote work and online learning can provide the flexibility required for important social activities to continue, but this does not equate with efficiency or productivity gains. Expectations should match the circumstances: technologies can allow us to do things better, faster, or elsewhere—but not necessarily all at once. We should not fall into the trap of believing that the best technologies are the ones that make it to the market.

Openness

Openness is a value and set of practices that evolved, in the digital age, from the traditional research library purpose of collecting and sharing scholarly outputs. It thus guides an array of research library activities including building digital collections and negotiating licensing terms for purchased digital content for new scholarly methods, such as text analysis and data mining. Openness is the

ideal that motivates our open-access efforts and drives research libraries to partner in building data infrastructures and standards that support interoperability and data sharing. This value serves research libraries well as we prioritize work that supports distance learning and off-site research. Nurturing this value in times of trouble will ensure that our hard work done under duress is still available to our constituents in calmer times ahead of us.

Collaboration

One finding across all aspects of our inquiry was the importance of collaboration to achieving research library objectives. Furthermore, our team learned that research libraries have earned credibility as capable partners for projects that advance or adopt emerging technologies.

As interdisciplinary spaces, research libraries have the respect and the potential to bring actors from across campus into partnerships to achieve complementary goals. Interoperability is both a goal of the technologies we build and a metaphor for partnering across campus. Collaboration allows research libraries to fuse their objectives to other efforts on campus, enabling those efforts to scale up, and also allows them to learn what constituents need and what research libraries can provide—while still setting agendas for research library outcomes.

Data and Data Infrastructure

Not surprisingly, data figured heavily in all of our findings. It is the fuel for business decisions, consumer technologies, and both traditional research and emerging forms of data-intensive scholarship. As computational technologies continue to develop in every sector of society, they are powered by data, from the digital trace data that people generate through very ordinary activities, to data created through creative and social activities, to data produced through industrial activity and research. Even under pandemic conditions, research libraries will continue to have opportunities to participate in shaping infrastructures for collecting and processing data, drawing on long expertise in this area.

Research libraries can facilitate computational use of collections through digitization projects and negotiations for licenses that permit this use of subscription collections. As awareness of data visualization and analytics grows, so does a base of new users (including those working in libraries) who want to use computational tools to do new things. Many of these users are just starting to scale the learning curve. There's also immense potential for research libraries to use data-centric tools like machine learning internally as a way to enrich descriptive metadata and create text corpora.

Even when research libraries can't launch new projects, they can continue current infrastructure development with attention to FAIR (Findable, Accessible, Interoperable, Reusable) and LOUD (Linked, Open, Usable, Data) standards and other tools that promote and reward data sharing, citation, and reuse, both for research and for learning.

Digital Fluencies

Crucially related to data is the question of how we incorporate the whole ecosystem of data-powered, digital tools into learning. "Digital fluencies" relates to a host of skills that students and faculty needed even before the pandemic but that will be in even greater demand for navigating the online worlds in which students and faculty will learn and socialize to varying degrees in the months ahead.

As we learned through this project, experts and stakeholders anticipate that research libraries, drawing on their experience and professional history of protecting patrons' privacy, confidentiality, and intellectual freedom, can convene and guide discussions on the use of data collected in classrooms and through institutional operations. Building on information literacy and library research instruction, research libraries have a timely opportunity to help students learn where data comes from and how to scrutinize it, to learn how ideas, facts, and information move through digital tools and social media to be used and misused, and to learn how they can participate in furthering knowledge and expressing that knowledge in powerful new ways.

Concluding Thoughts

As a society, we are learning that pandemic time is a time of contraction and withdrawal. But important processes are happening even when organisms appear dormant. Roots are growing deeper, and energy is being stored for fast growth when conditions are right.

Research libraries may not be able to act now on all of the findings identified in the ARL-CNI-EDUCAUSE project, but they can practice the values and nurture the relationships that will allow research libraries to move quickly when opportunity arises. Importantly, because of things that research libraries have been doing for a long time, they are able to rise to the occasion and support learning and research right now, under highly stressful conditions. Conversely, by continuing to direct their efforts to this support—centering the values of openness and collaboration, keeping in mind the context for technological adoption, and anticipating the roles of data, data infrastructure, and digital fluencies—research libraries will further their own objectives over the long term. ∎

Notes
1. Sarah Lippincott, *Mapping the Current Landscape of Research Library Engagement with Emerging Technologies in Research and Learning,* ed. Mary Lee Kennedy, Clifford Lynch, and Scout Calvert (Association of Research Libraries, Born-Digital, Coalition for Networked Information, and EDUCAUSE, 2020); Scout Calvert and Mary Lee Kennedy, *Emerging Technologies for Research and Learning: Interviews with Experts,* ed. Clifford Lynch and John O'Brien (Association of Research Libraries, Coalition for Networked Information, and EDUCAUSE, March 2020).
2. Scout Calvert, *Future Themes and Forecasts for Research Libraries and Emerging Technologies,* ed. Mary Lee Kennedy, Clifford Lynch, and John O'Brien (Association of Research Libraries, Coalition for Networked Information, and EDUCAUSE, 2020).

Scout Calvert, Data Librarian at Michigan State University, is currently serving as ARL Visiting Program Officer for Strategic Partnership to Advance Research Libraries' Impact in a World Shaped by New Technologies.

Learning from a Crisis: Human + Machine

AI is a change pressure we should not ignore. In the aftermath of COVID-19, we can expect an acceleration of AI and automation as companies seek ways to continue operating while protecting public health.

The first three *New Horizons* columns in 2020—published in February, May, and August—set out to explore the ways in which artificial intelligence (AI) will challenge the traditional model of higher education and how the sector should respond. These challenges lie in how we will learn and work in the future. Our response depends on our shared sense of urgency, our willingness to lead, and our ability to experiment.

In the first column, George Siemens describes a "post-learning" era in which learning is evolving into a cognitive partnership between humans and the AI technologies that outperform us in traditional educational tasks. AI, he argues, will push educators to respond by exploring and designing the range of learning activities that are likely to remain human.[1] In her column Allison Salisbury reminds us that AI is also fundamentally changing the nature of work and the types of jobs that will be needed. Colleges and universities should respond to that change by creating experiences that go beyond domain knowledge to develop occupational identity, social capital, and skills.[2] In the future, graduates' agility may matter more than their degree.

AI is a change pressure we should not ignore. In the aftermath of COVID-19, we can expect an acceleration of AI and automation as companies seek ways to continue operating while protecting public health.[3] Those jobs—many of them frontline jobs—are unlikely to return. Americans in these jobs will need the agility to change direction. They will seek that agility through education. This, as Brian Fleming wrote in the second *New Horizons* column this year, is where we can find some good news for higher education. Americans have more trust in higher education institutions than in companies to take the lead in building, managing, and governing the ethical uses of AI in everyday life.[4] They also look to colleges and universities to help them achieve the economic mobility they desire. In order to lead change, we in higher education need to engage in the change.

We are ready for this. A lot has happened since January 2020. Almost overnight, the COVID-19 pandemic became an immediate threat to traditional higher education models, and our resilience has been tested. The response wasn't perfect, but institutions addressed the urgency by altering existing models in real time and by continuing to improve on new models to deliver on their missions. At my institution, Davidson College, instructional designers, librarians, and IT professionals quickly scaled online infrastructure and faculty professional development. Our faculty embraced an improvement and committed themselves to preparing for an online and hybrid education in the fall term. Our staff reimagined every aspect of student services for a digital campus in the event we would continue on a remote basis. We led from care and saw firsthand how we can change quickly when all of the oars are moving in the same direction.

Leading from care should not stop at the current crisis. Caring also means looking more deeply at what lessons we will take away from this crisis and what learners need most from higher education going forward. Campus presidents generally agree that most institutions are unlikely to return completely to the pre-COVID models.[5] The cost of higher education—already out of reach for many—has been made worse by a deepening economic crisis. The perceived value of online learning does not match the cost of a residential tuition. And more students will look more closely at less-expensive alternatives, especially if companies develop their own training and remove the requirement of a college degree.

Online learning was demonized at most traditional institutions in the spring. "Zoom U" was practically a slur. But the longer this goes on, the more likely it is that institutional leaders will acknowledge that some of the affordances of online learning and a pared-down campus are worth keeping. Do we actually need all of the committee work we had in place before? If learning is happening and if we can maintain an intellectual community from afar, how might we leverage online processes to do
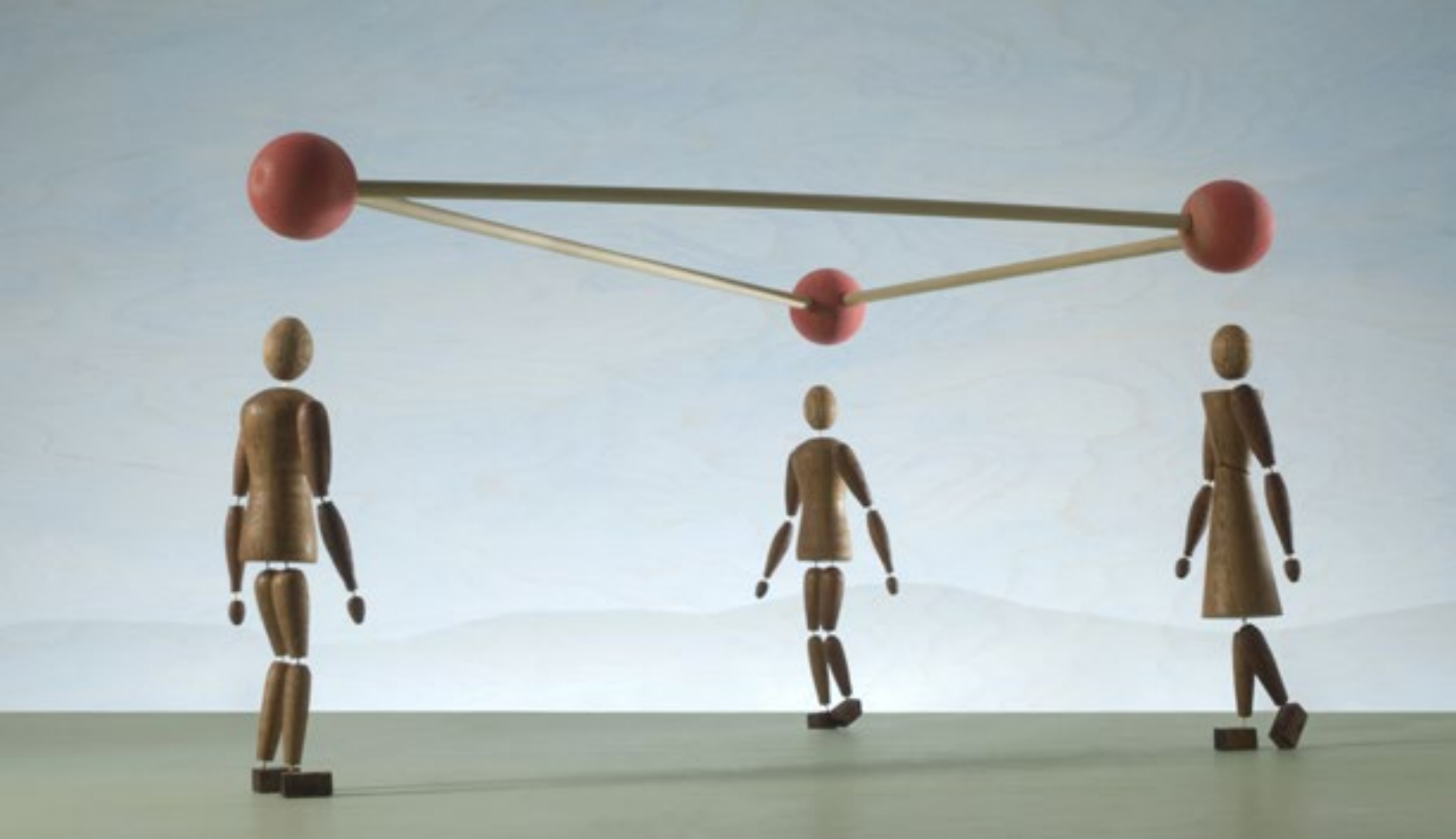
things we previously thought impossible to accomplish except in face-to-face situations? Are students learning as much in less time? If so, how might we lower the cost to a degree?

Where Do We Start?

To understand how we might respond to AI, we can start by answering "questions about how to balance human and artificial cognition and about which domains of human cognition can (and cannot) be duplicated by technology."[6] Related to this, we can design more intentionally for the uniquely valuable aspects of a college education. According to a Gallup-Purdue study, a life-altering college/university education includes six key experiences categorized as "relationship-rich" and "work-integrated":

- "I had at least one professor who made me excited about learning."
- "My professors cared about me as a person."
- "I had a mentor who encouraged me to pursue my goals and dreams."
- "I worked on a project that took a semester or more to complete."
- "I had an internship or job that allowed me to apply what I was learning in the classroom."
- "I was extremely active in extracurricular activities and organizations."[7]

Unfortunately, only 3 percent of all college/university graduates report having had these experiences. However, as Carol Quillen, president of Davidson College, has written: "Let's not confuse this falling short with the foundational importance of the mission."[8] What learners need is a greater concentration on the uniquely human habits of mind and the educational experiences that foster them. Now is a good time to focus on a collective response to the accelerating changes of AI and on what we have learned from the COVID-19 crisis.

Notes
1. George Siemens, "The Post-Learning Era in Higher Education: Human + Machine," *New Horizons* (column), *EDUCAUSE Review* 55, no. 1 (2020).
2. Allison Salisbury, "Preparing Workers for Anything: Human + Machine," *New Horizons* (column), *EDUCAUSE Review* 55, no. 3 (2020).
3. Alana Semuels, "Millions of Americans Have Lost Jobs in the Pandemic—and Robots and AI Are Replacing Them Faster Than Ever," *Time Magazine,* August 6, 2020.
4. Brian Fleming, "Artificial Intelligence: Threat or Opportunity?" *New Horizons* (column), *EDUCAUSE Review* 55, no. 2 (2020).
5. Rick Seltzer, "Who Leads Colleges After COVID-19?" *Inside Higher Ed,* September, 9, 2020.
6. Siemens, "The Post-Learning Era in Higher Education."
7. Brandon Busteed, "The True 'Magic' of College Happens for Just 2 out of 100 Students," *Forbes,* August 22, 2020.
8. Carol Quillen, "Covid-19 Threatens Higher Ed—and Also Offers a Path Forward," *Forbes,* May 28, 2020.

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5 Practices for Collaboration and Partnership

In an age of ever-increasing demands on technology and ambitious expectations for digital transformation, **the *what* of our work is only half the story.**

Most of us in higher education IT roles are accustomed to thinking about our work as strategic and beneficial to the overall good functioning and core priorities of our institutions. That's certainly true of our projects to improve major systems and services. Any effective CIO needs little prompting to state the top priorities the IT team is focusing on, at any given time, to keep the institution in a strong position with respect to information technology. But in an age of ever-increasing demands on technology and ambitious expectations for digital transformation, the *what* of our work is only half the story. The *how* matters as well for the constructive and sustainable change we are often trying to enable in our projects, services, and strategic plans. Here are five practices that not only support successful IT operations but also enable the resilient collaboration and partnership that is essential to strategic success within IT teams and across the institution.

1. *Build a culture of institutional citizenship.* This is a seemingly obvious approach that takes consistent effort and focus to sustain. You start with the goals of the institution, the current priorities, and the big questions in play. From there you explore the ways in which different people across the institution are grappling with them. What do campus partner groups want to accomplish? What new innovations are emerging in the curriculum? How are partners in alumni relations, career development, and co-curricular programs connecting to each other and to students? What kinds of questions do institutional research colleagues want to answer? What can the experiences of the IT team bring to bear? Where do IT team members have common ground with colleagues in other parts of the institution? Answering these questions is not the sole province of the top IT officer or the IT senior leadership team. Engaging the full IT team in regular discussion of these questions—within the IT organization and in cross-disciplinary groups—can lead to better-informed and aligned plans for the IT service portfolio.

2. *Define guiding principles.* What will determine how you make decisions in your work? What will you focus on in the event you have to choose between options or move away from familiar practices? What approaches do you need to follow to address institutional goals? Defining a few key guiding principles will help you communicate clearly and consistently about what's most important to accomplish in your project, program, or service. For example, in moving from an older system to a new one, you may define guiding principles around the degree of configuration or customization you want to allow. If you are developing an institutional practice of data stewardship, you may have a guiding principle of defining a clear system of record for key data elements. In operational contexts, you may have a guiding principle of solving higher-order problems to the fullest degree possible, rather than simply resolving the same repeated problems more quickly. Once these guiding principles have been defined, you can use them to help with decision making and to prompt constructive conversations at times when the work is not fully aligned with the principles that have been agreed upon.

3. *Be intentional about shared team context.* Talk together about what's important in a project or service from the perspective of different participants and users. What does a good day look like for the members of the team? For different users? What does a bad day look like? What's the one problem that would be a huge win if solved? How does what you're providing or working on fit in the daily experience of the user? What pieces have to fit together for everything to go well for the user? For your team? Who's paying attention to how those pieces fit together? As you talk through the answers to these and related questions, you can develop a holistic picture of your context and how effectively the individual and collective work of your team is positioned for what you hope to achieve.

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4. Identify and manage key dynamics proactively. In most settings, the people involved in a project or service know that a couple of potentially challenging dynamics are likely to surface at one or more points along the way. Perhaps the challenge is a long-held frustration over the length of time that has elapsed without attending to a particular IT need. In some cases, people may be reluctant to move away from an outdated plan because a lot of hard work went into its development, even though conditions or expectations have changed. Maybe the team members don't have full confidence in their mastery of a new technical approach. Perhaps a working group is larger than it needs to be because some stakeholders are concerned that sitting in is the only way to be represented in key deliberations and decisions. Naming these dynamics as early as possible, and working with team members to define clear strategies for monitoring and managing them, can help keep related issues from having a disproportionate impact on the team's work or outcomes.

5. Clear the path for good work to get done. Teams and partners are most effective when there is a clear commitment to mutual success. Make it a shared goal to check in regularly on how things are going. Set a tone of openness, giving colleagues an opportunity to ask questions, discuss approaches, or express

constructive differences of opinion. Identify where teams need help to make progress, providing or advocating for "air cover" to offer support when necessary, and establish a norm of raising concerns proactively if there's anything making it difficult to get priority work done. Draw regular connections to the bigger institutional picture and guiding principles, and never pass up an opportunity to celebrate great work and give credit! These small examples of operational mindfulness will go a long way toward fostering a sense of forward progress and collegiality.

In following these practices, those of us in IT roles can strengthen how we go about our work and, in doing so, increase the chances of ongoing success and effective partnerships. And in modeling these practices in cross-functional teams with others across our institutions, we can develop shared ways to manage through the complexities we all face in our work from time to time. This positions the IT team for an additional kind of strategic contribution, moving beyond the *what* and enabling the *how* of collaboration and partnership. ∎

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