



## REIMAGINING MINNESOTA STATE

### About Minnesota State

Minnesota State is an interdependent network of 37 vibrant colleges and universities committed to collectively nurturing and enhancing a civically engaged, socially mobile, and economically productive Minnesota. As a system, we foster the success of all students, no matter where they are enrolled, and we support the vitality of all Minnesota communities, no matter where they are located. With seven universities and 30 technical and community colleges on 54 campuses throughout the state, Minnesota State is the largest single provider of higher education in Minnesota, and the fourth largest system of higher education in the country. Six out of ten undergraduates in the state are Minnesota State students.

We are deeply committed to being a place of hope and opportunity for students who dream of becoming our state's next generation of professionals and leaders – no matter who they are or where they come from. This is critically important for students from communities traditionally underserved by higher education, including the 22 percent of our students who come from families of limited financial resources; 17 percent who are students of color and American Indian students; 13 percent who are first-generation students; and three percent who are veterans and service members. Minnesota State serves more students from these communities than all other higher education options in Minnesota combined.

Our campuses play an essential role in growing the state's economy through talent development. Every year, the system enrolls roughly 375,000 students every year – 120,000 of whom are in non-credit courses and customized training programs designed for businesses – and awards over 38,000 degrees, certificates, and diplomas. Eight out of ten graduates get jobs in fields related to their programs and stay in Minnesota.

### Reimagining Minnesota State: Three Big Questions

Through the *Forum on Reimagining Minnesota State*, we will learn together and respond to the three big questions presented by the Chair of the Minnesota State Board of Trustees that will inform the future of the system.

***What is Minnesota State's unique value proposition to the State of Minnesota?*** What are the key educational, economic, and social goals that Minnesota State must address to create a better way of life for all people of Minnesota?

***How does Minnesota State foster a culture of innovation, collaboration, and partnership as we share responsibility for the achievement of our key goals?*** How do we empower our employees and

students to experiment with and collaborate on innovative approaches to move the needle on our key goals?

***How do we leverage our “systemness” to the benefit of our students and the state?*** What is the unique role of our public higher education system that makes the system more than the sum of our parts? How does Minnesota State act more like an interdependent network that fosters the success of all students no matter where they are enrolled and supports the vitality of all Minnesota communities no matter where they are located? How will we offer a diversity educational delivery methods and continue to attract and serve a more diverse student population.

**Forum on Reimagining Minnesota State**  
**Session 2: The Digital Age**  
**Briefing Paper 2**

*By Dr. Lisa H. Foss, Chancellor's Fellow*

**Forum Description:**

*Session 2: The Digital Age: The impact and future possibilities offered by data and technology will explore the impact data and technology are having on the future of higher education. Presenters will share how emerging technologies, data analytics, and artificial intelligence are reshaping learning, student support, and operations and changing expectations for delivery among students and employers. Session 2 will explore the ways the higher education industry is reacting, adapting, and thriving through technology-driven innovation in a rapidly changing environment.*

**Forum Session 2 Discussion Questions:**

1. How are the factors/issues outlined in the Session 2 Briefing Paper and presentations impacting your organization/institution now and how might they impact them in the future? How has your organization/institution balanced investment in technology with increasing demands for other key investments?
2. What are strategies or promising innovations you are pursuing to respond to these types of disruptions? How do you address issues of equity and inclusion within the execution of these and future strategies?
3. How might Minnesota State reimagine educational and service delivery through strategic innovation in the areas of technology and data analytics to support student success, enhance student learning, expand access to programs and credentials, and reduce costs?
4. What are opportunities for Minnesota State institutions and other organizations to partner and collaborate in order to more successfully address these forces or pursue future strategies?
5. In order to address these disruptions, how might Minnesota State encourage, support, and enable greater innovation and entrepreneurial activities without losing its responsibility for advocacy and accountability?

**Introduction:**

Data and technology is seen as the great disruptor of industries across the world, and higher education is no exception. Technology and data has the potential to impact all of an institution's administrative and academic functions and transform the experience of students and employees. There is great excitement that technology will finally allow institutions to break the so called "iron triangle" of affordability, quality, and access – three critical factors that institutions have struggled to simultaneously address.

But while educational and technology leaders are lauding the potential of technology to transform quality, affordability and access, they also remind us that technology is not a panacea to the challenges

facing higher education and that any discussions of changing practices as a result of technology should not be viewed simply through the lens of cost-cutting but through the lens of student success. Making progress on the “iron triangle” will require understanding the human processes involved in teaching and learning, the value proposition for students, the cultures of the organizations, and the approaches to implementation. Since education and human development and capacity building are processes of human interaction, it is argued that the most successful technology implementations will be driven by an understanding of how technology can enhance those interactions and not replace them. This will require a more nuanced understanding of the learning and support needs of different student segments, more clearly defined outcomes and competencies to be achieved, and an understanding of the changing nature of professional roles across the academy.

### **The Call for a Student-Centered Higher Education Ecosystem**

The U.S. Department of Education is now arguing that U.S. higher education may need to behave more like an education ecosystem, in which “both traditional institutions and new providers, underpinned by a digital infrastructure allow students to create, recognize, and value quality learning experiences wherever and whenever they are most convenient, and that rewards the expertise they develop within and outside of formal institutions over their lifetimes” (Reimagining the Role of Technology in Higher Education).

They argue that an advanced digital infrastructure will be necessary to successfully deliver this ecosystem along ten domains that are ***key to the success of all students***.

1. **Guide students toward education that enables them to achieve their goals**, is suitable to their needs, and aligns with their interests by providing digital resources for evaluating various education and career pathways.
2. **Help students make wise financial decisions about postsecondary education** by providing clear information on return on educational investments and/or post-college employment, reporting of cost, financial aid, and outcomes.
3. **Prepare students for postsecondary-level work** by providing low cost or no cost diagnostic tools and adaptive, targeted remediation.
4. **Allow students to adjust the timing and format of education** to fit other priorities in their lives by providing multiple models of delivery and multiple points of entry and exit.
5. **Provide students with affordable access to high-quality resources** they need to be successful and to empower them to become curators of their own learning and providing them access to affordable, up-to-date learning materials that are based on current learning research and are accessible to all.
6. **Enable advisors to help students progress through changing needs and circumstances** by leveraging robust data to provide students with guidance through times of transition and provide actionable data directly to students.
7. **Help institutions identify and provide timely and targeted assistance** to students by providing access to course specific learning analytics data to inform early and individualized interventions.
8. **Allow students to build meaningful education pathways incrementally** by offering stackable and transferrable credentials to allow for movement across institutions.
9. **Allow students to document their learning in ways that can be applied to further education or meaningful work** and allow students to accurately demonstrate a variety of learning outcomes that are transparent and portable.

10. **Create a network of learning that supports students as creators and entrepreneurs, and agents of their own learning** and supports continuous learning through a digital infrastructure that enables everywhere, all-the-time learning.

They argue that delivering on these dimensions will be beyond the resources of any single institution and will require partnerships and collaborations across higher education institutions, traditional and non-traditional, and with industry and other external partners to create the type of change that will be necessary to serve the students in the future. As institutions expand the use of technology to deliver on improved student learning and success, the U.S. Department of Education cautions that institutions and systems must maintain a commitment to the following:

- **Equity:** It is imperative that the key goal remains ensuring all students have affordable and equitable access to learning experiences, particularly those who stand to gain the most from higher education.
- **Access:** We must continue to leverage technology to deliver high-quality learning opportunities to those who need it most.
- **Affordability:** We must consider ways to ensure technology-enabled learning is affordable for students.
- **Completion and Outcomes:** We must shift our focus to outcomes through data within institutions and across the ecosystem – outcomes for both student learning and post-program student success.
- **Research:** We must conduct more research that tests effectiveness and informs practice. It is vital that the ongoing innovation that contributes to the higher education ecosystem is supported by research and builds a strong evidence base for technology-enabled learning.

### **Emerging Technology Themes**

There is a growing consensus that technology has the opportunity to impact higher education and its learners along four major themes.

**Technology as a method to provide greater access.** Learners are no longer limited by time or place as a determinant of what educational options are available to them. Increasingly the choice is not online or face-to-face. Students will expect more hybrid combinations in the future because they will want the benefits of face-to-face experiences with a robust, technologically enhanced learning environment. Open access, digital resources will allow learners to access high-quality learning materials at a lower cost. Another future expectation is that students will be less willing to spend class time or pay tuition learning basic knowledge that is readily available through other sources and instead will prefer class time be focused on the application and integration of knowledge, through hands-on learning and collaboration. Increasingly, technology is allowing learners to access content and learning pathways beyond the traditional two- and four-year institutions, through non-traditional providers located in their workplace, in their community, across the country and around the world. Technology also provides opportunities for students with disabilities to participate in and benefit from educational programs and activities, including automated closed captioning and descriptive text in order to improve accessibility.

**Technology as a way to enhance and personalize learning and support.** In the academic experience of the future, adaptive learning technologies will provide personalized content based on the level of the student and allow them to move quickly through content they already know. The technology will adapt and respond to the student, creating customized content and personalized self-study curriculum. Embedded remediation, personalized learning pathways, and instruction that responds to a student's

prior knowledge are seen as especially promising for students who come to college underprepared or with a range of different skill levels and learning needs.

Emerging technologies are being designed to monitor a student's progress, not just in a single course, but over the course of their college career, to empower the student to make informed decisions about their own learning and to track other forms of learning that are not part of the official education system. E-learning systems will create opportunities for collaborative and immersive learning through animations, gaming and hands-on simulations. Technology also has the opportunity to create a greater sense of community through social networking and team-based projects, and some see possibilities in bringing students from different backgrounds and experiences together by expanding the classroom to other parts of the world and creating more common spaces and opportunities for meaningful interaction.

Another area of discussion is the potential for predictive analytics to create personalized support to improve retention and success. Electronic student support systems are being designed to monitor student engagement and degree planning and allow for automated messaging and warning to faculty and advisers when students are perceived to be in trouble, even before the student may be aware of the issues themselves. Because of the potential of personalization through predictive analytics, some see a future in which institutions provide tiers of services based on student needs. This will require an unbundling of many of the student services that are now considered as a single product so that learners can access those that are most relevant to their educational experience.

**Technology as a mechanism to support effective teaching.** Technology-supported learning creates rich information for faculty to continuously improve their teaching practices by understanding in real-time how and what students are learning, to empower students to be agents of their own learning; and to identify students who are struggling so they can be directed to academic and non-academic interventions and supports. Technology-enabled assessments can provide a more immediate, complete, and nuanced picture of student needs, interests, and abilities, allowing for more immediate, targeted feedback. Technology-enabled assessments also provide opportunities for instructors to better understand the effectiveness of their teaching practice. Technology should not replace faculty, but faculty, including contingent faculty, must be supported in their ongoing development of research-based teaching practices and in effectively using data-driven student support systems that promote student success. Research supports that the integration of deep disciplinary knowledge with learning science creates high-quality learning experiences for students.

**Technology as a way to connect a lifetime of learning.**

Increasingly, students will accumulate learning experiences at different times and through different institutions and organizations. As lifetime learning becomes a necessity for ongoing career success, individuals will need to be able to capture and communicate their learning and credentials in a unified way. Students will need to be able to map their learning and the mastery of competencies and skills across courses and programs and into credentials that are stackable and portable over time. This will require a standardized technology infrastructure that translates these learning experiences into verified and portable competencies, skills and credentials and an interoperable system to document learning across traditional and non-traditional institutions. An integrated, interoperable system would potentially facilitate more seamless, transparent credit transfers between institutions and provide for better quality assurance across learning experiences.

## Digital Literacy

Beyond how technology is disrupting higher education institutions and practices, data and technology are becoming vital skills and competencies for success in the workplace and society. The importance of digital literacy as an educational outcome is being discussed at all levels of education (primary, secondary and post-secondary). Increasingly institutions are being asked to develop students' digital citizenship, promoting responsible and appropriate use of technology, as well as their capacities to understand the digital environment and create content in this domain. In order to support students' learning, institutions are supporting the professional development of their faculty and staff so they can appropriately guide their students in the use of emerging technologies and digital environments.

Even as digital skills become increasingly important, educators are arguing that developing students' critical thinking, mental flexibility and cultural competence will be even more critical as these uniquely human traits will be even more necessary as the workplace becomes increasingly engaged with artificial intelligence and robotics. Dr. Joseph Auon, President of Northeastern University, calls this new model of developing advanced technology and humanistic competencies "humanics". He argues that "in the future, three new literacies (technological, data, and human) will form the foundation of content knowledge and mastery. These literacies will be facilitated by new pedagogical approaches that develop four cognitive capacities (critical thinking, systems thinking, entrepreneurship, and cultural agility) – a sort of reframed trivium and quadrivium for the modern age" (Association of Governing Boards of Universities and Colleges).

## Digital Equity

Central to the promise of technology to enhance student success and support student learning is the fact that all aspects of the learning environment must be equally accessible and usable for all learners and instructors. But access to technology and high-speed internet is not equal. Students from rural areas and from low-income households do not have the same level of access and recent efforts such as the Bring Your Own Device (BYOD) movement has actually widened the access gap in some communities because not all students have the technology – smartphones, tablets, and laptops – needed to participate. Because of the high cost of development and implementation, students at more affluent educational institutions have greater access to emerging technologies and open educational resources. Digital equity also refers to supporting educators with appropriate training to implement digital solutions because faculty and staff must be digitally literate if they are to teach students. To be useful for low-income and historically marginalized student populations, digital tools should be measured against four criteria:

- **Cost:** The tools should be inexpensive, if not free, so that students from a broad array of backgrounds can benefit
- **Accessibility:** The tools should be available on a variety of devices (including computers, tablets, and cell phones) and operating systems
- **Relevance:** The tools should offer relevant content to a clearly established target audience
- **Credibility:** The tools should have a track record of success, up-to-date information and a business model mindful of the needs of the audience.

## Emerging Areas of Technology in Higher Education

Within the discussions of the technology in higher education, three emerging areas are being discussed and debated.

**Artificial Intelligence:** Artificial Intelligence (AI) is transforming professions and whole industries across the globe. Currently in higher education, AI is being explored as a means to complete routine, time-consuming tasks so instructors can spend more time on facilitating and integrating high-quality learning experiences for their students or for automating some aspects of student support to provide real-time, personalized responses. The appropriate use in higher education is still widely debated and cost for adoption is still quite high but researchers are exploring the following areas as having possible applications in the higher education environment: computerized teaching assistants, automated grading, technology-enhanced studies, and monitoring behavior.

**Data Analytics and Analytics Technologies:** Expanding interactions with technology is creating vast amounts of data. Institutions are pursuing strategies to leverage these data to inform institutional decision making and to provide insights into student learning and support. Institutions are developing data asset management strategies that purposefully leverage data acquisition and management as a strategic priority. Data analytics is also being used for formative evaluation of new programs and services to measure effectiveness and inform continuous improvement. Predictive analytics are also being used to inform improvements across the institution, including identifying at-risk students, guiding students to completion, improving learning outcomes, informing recruitment, enhancing alumni relationship management, and improving research productivity. But even as data analytics provides a more detailed understanding of institutional performance and student success, institutions must be careful to provide responses and interventions that are in the best interest of the individual student.

**Immersive learning:** The 2018 Horizon's Report cited a recent study in which 81% of faculty respondents said that virtual reality (VR), augmented reality (AR), and mixed reality (MR) will be key educational technologies over the next decade. Immersive learning is already being used in fields such as nursing, medical science education, engineering, the sciences, and digital humanities to create real-life learning experiences for students. As the costs of such technologies continues to fall, opportunities for use within a diversity of academic fields and disciplines is growing. One promising area is students as producers, not just consumers, of immersive learning content through open access virtual reality labs. The convergence of artificial intelligence and virtual reality hold the potential of creating individualized learning experiences, as the devices learn user behaviors and can respond in real time. Expanding use of AI and virtual reality will require a reconsideration of accessibility and ethical issues to ensure students have equitable access, as well as have their personal information and privacy protected in these data rich environments.

### **Cautions and Considerations**

Leveraging technology to support something as personal and multi-dimensional as learning will not be easy, and it requires some careful considerations. A significant concern is that access to technology and high-speed Internet is not equally distributed. Currently 24 million Americans, mostly poor and rural, do not have reliable Internet access. Ensuring equity will require a consideration of how to deliver and provide equal access to those students who already are disadvantaged.

Emerging research points to the role of connections and engagement as an important element that drives student success. Done incorrectly, as a means to drive efficiencies and cost reductions alone, technology can create and reinforce a sense of isolation and disconnect and lower the quality of the educational experience. Even as technology is used to provide more services and instruction to students, institutions will need to rethink how to provide person-to-person contact between the institution and student and ensure that the important work of connecting and integrating learning that happens within a university's environment is not lost in the pursuit of faster and cheaper delivery.



Adopting emerging technologies into ongoing operations will require significant investment in both development, implementation, on-going maintenance, and professional development of employees to ensure they are well prepared to integrate technology-enabled learning and support systems into existing professional practice. Institutions will need to balance investments in technology with other demands for key investments.

There is limited research on the positive impact of classroom technologies on learning, especially in the foundational dimensions of higher education – critical thinking, creative problem-solving and human interaction. There also is widespread concern that not all students benefit equally, and some are negatively impacted, by online instruction. Some research suggests that students from high-risk populations learn less in online courses than from equivalent face-to-face courses.

There is emerging consensus that the optimal instructional model in the future is one that blends the traditional and the technological and that advanced technologies such as artificial intelligence, machine learning, and automation, should be used, not as a replacement for but to complement, enable and improve teacher-student interactions. The human connection remains critical with well-designed technology as the enabler for that connection. Courses and content will need to be thoughtfully designed using best practices in learning science and focused on creating connected and collaborative learning experiences.

## Reading List:

- Association of Governing Boards of Universities and Colleges (2018). Artificial Intelligence and Higher Education. *Trusteeship Magazine*. March/April 2018: pp. 9-13.
- Becker, S.A., Brown, M., Dahlstrom, E., Davis, A., DePaul, K., Diaz, V. and Pomerantz, J. (2018). NMC Horizon Report: 2018 Higher Education Edition. Louisville, CO: EDUCAUSE, 2018.
- Bienkowski, M., Feng, M., & Means, B. (2012). Enhancing Teaching and Learning through Educational Data Mining and Learning Analytics: An Issue Brief. U.S. Department of Education, Office of Educational Technology. Washington, D.C. October 2012.
- Craig, E. and Georgieva, M. (2018) VR and AR: The Ethical Challenges Ahead. *EDUCAUSE Review*. April 10, 2018.
- Craig, E. & Georgieva, M. (2018). From VR and AR to Our XR Future: Transforming Higher Education. *EDUCAUSE Review*. August 22, 2018.
- Del Casino, V. (2018). Machine learning holds promise for higher ed, but only if used the right way. *Inside Higher Ed*. March 21, 2018.
- Grajeck, S. (2018). Looking ahead at IT and higher ed: An interview with Vernon Smith. EDUCAUSE.edu. July 16, 2018.
- Internet Access and Education: Key considerations for policy makers. Internet Society. November 2017. Retrieved from [www.internetsociety.org](http://www.internetsociety.org)
- Jaschik, A. and Lederman, D. (2018). 2018 Survey of Faculty Attitudes on Technology. *Inside Higher Education* & Gallup.
- Kelly, R. (2018). 7 Ed Tech Trends to Watch in 2018. Campus Technology Virtual Roundtable. Jan. 11, 2018. Retrieved from [Campustechnology.com](http://Campustechnology.com)
- LeBlanc, P. (2015). When IT No Longer Remains Anonymous – For All the Right Reasons. *EDUCAUSE Review*. Nov/Dec 2015. Pp88-89.
- LeBlanc, P. (2015). The Human-Technology Intersection: A Framework. *EDUCAUSE Review*. March/April 2015. Pp. 48-49.
- Lynch, M. (2018). 7 Roles for Artificial Intelligence in Education. TechAdvocate.org. May 5, 2018.
- McKenzie, L. (2018). Academics push to expand use of AI in higher ed teaching and learning. *Inside Higher Ed*. Sept. 26, 2018.
- Office of Educational Technology. Reimagining the Role of Technology in Higher Education: A supplement to the National Education Technology Plan. U.S. Department of Education. January 2017.
- Parnell, A., Jones, D., Wesaw, A., & Brooks, D.C. (2018). Institutions' Use of Data and Analytics for Student Success: Results from a National Landscape Analysis. A Joint Publication of EDUCAUSE, Association for Institutional Research and NASPA-Student Affairs Administrators in Higher Education.
- Pasquini, L. (2017) 4 Things to Consider When Teaching Digital Literacy to College Students. *EdTech Magazine*.
- Pomerantz, J. and Brooks, D.C., (2017). ECAR Study of Faculty and Information Technology, 2017. Research Report. Louisville, CO: ECAR, October 2017.
- Pullias Center for Higher Education (2018). How is technology addressing the college access challenge?: A Review of the landscape, opportunities and gaps. A report by Pullias Center for Higher Education & Get Schooled.

- Seyferth, T. (2017). The future of higher education – How will assessment technology play a role? Oct. 23, 2017. Retrieved from [www.ChalkandWire.com](http://www.ChalkandWire.com)
- Vanderbilt, T. (2012). How Artificial Intelligence can change higher education. *Smithsonian Magazine*. Dec. 2012.
- Working Group on Education: Digital skills for life and work. UNESCO Broadband Commission for Sustainable Development. September 2017.