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National
eLearning Center

THE FUTURE OF DIGITAL LEARNING IN THE KINGDOM OF SAUDI ARABIA

| A Landscape Analysis and Exploration of the Trends
| Shaping the Future of Learning

TABLE OF CONTENTS

Executive Summary	03
Introduction	04
Context & Framework	06
Dimension 1: Design	13
Dimension 2: Teaching & Learning	18
Dimension 3: Assessment	30
Future Directions & Recommendations	38
Conclusion	43
References	44
Contributors & Advisory Council	47

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EXECUTIVE SUMMARY

The National eLearning Center (NeLC) in partnership with the Online Learning Consortium (OLC), has identified great potential for digital learning in the Kingdom of Saudi Arabia (KSA). The purpose of this report is to explore global trends, emerging research, innovative models, and expert insights regarding the future of learning by detailing the present context of a rapidly changing and hyper-connected world.

Our innovation framework for describing the future of digital learning, which emerged during the research process, covers three dimensions: (1) **design**, (2) **teaching and learning**, and (3) **assessment**. Building on the established partnership between the NeLC and the OLC, the findings presented in the following report expand on previously published recommendations for the future of learning in general, by highlighting unique themes and emerging trends that span technology-enhanced and online learning contexts alike.

The main recommendations from the study include the following:

1. Expand broadband and high-speed internet to facilitate the expansion of online learning and the promotion of ubiquitous educational access.
2. Support digital learning opportunities as well as personalized learning pathways to promote learner autonomy.
3. Explore emerging blockchain technology and its potential to provide secure transferability and support for knowledge sharing across the country.
4. Invest in digital educational content, media, and technology platforms.
5. Increase professional learning support that emphasizes deeper learning, digital learning, and learner agency.



INTRODUCTION

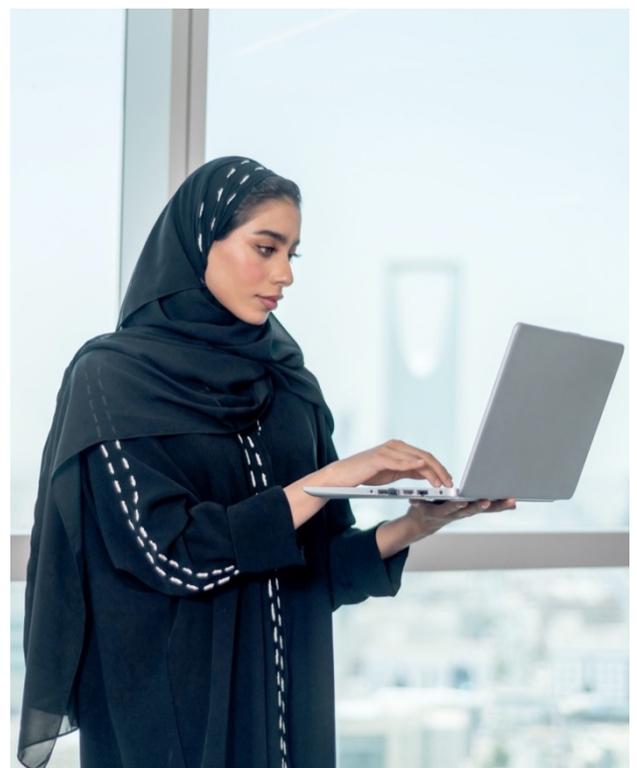
The Future of Digital Learning in the Kingdom of Saudi Arabia (KSA) stemmed from a partnership between the Online Learning Consortium (OLC) and the National eLearning Center (NeLC). The purpose of this report is to explore global trends, emerging research, innovative models, and expert insights regarding online and technology-enhanced learning specifically. The term “digital learning” is employed to fully capture the reality that future learning experiences may not always be connected but will necessarily be mediated by digital technology.

The body of this report is organized into eight primary sections. The **Executive Summary** (p. 3) provides an overview of the findings and recommendations of the study. This **Introduction** section (pp. 4–5) outlines the report sections as well as the methods used for collecting data. The **Context and Framework** section (pp. 6–12) situates the report content in the context of a rapidly changing world still navigating the evolving COVID-19 global pandemic. This section also establishes a framework for how the KSA might drive the future of digital learning based on three dimensions: systems and organizational design, teaching and learning, and assessment.

Each dimension of this framework, then, has its own section detailing how the KSA might explore emerging learning opportunities and innovations. **Dimension 1: Design** (pp. 13–17) grapples with myriad disruptions related to COVID-19 and the window of possibility that has opened for education professionals to pursue purpose-oriented explorations of ubiquitous and postformal learning opportunities. **Dimension 2: Teaching and Learning** (pp. 18–29) outlines

developments in deeper learning and learner-driven learning that include gamified and gameful pedagogies as well as related technologies. **Dimension 3: Assessment** (pp. 30–37) considers emerging trends and practices for assessing and credentialing learning, including both institutional and postformal learning experiences.

The report closes with the **Future Recommendations** section (pp. 38–42), which features possible strategic and operational steps the KSA can take to fortify educational opportunities for learners, followed by a brief **Conclusion** section (p. 43). The references and contributor attributions featured in the **back matter** (pp. 44–53) account for the myriad sources that have influenced findings. The references also provide empirical resources for additional scholarly inquiry.



Data Collection Methods

A systematic review of the relevant literature along with feedback from international education experts were instrumental in comprehensively detailing the global contexts, emerging trends, and actionable possibilities that have emerged for the future of learning in a volatile, uncertain, complex, and ambiguous (VUCA) post-COVID world.

The trends and stories featured in the following pages have been sourced and analyzed from publicly available datasets, trade/industry and popular press reports, organizational and commercial white papers, and academic research. This comprehensive publication also includes reviews of academic literature and syntheses of popular and market publications detailing the emerging trends in global education.

To supplement the report structure and illuminate the findings, experts from the KSA were surveyed in August 2021, to provide their insights and expectations for digital learning in the country. The results from their survey responses appear throughout the report to complement the trends explored in the following pages.



CONTEXT & FRAMEWORK

Context: Future Needs for Learning in a VUCA World

As distinguished education scholar Yong Zhao has noted, the COVID-19 pandemic that emerged in late 2019 and disrupted human civilization for over a year has created both a unique moment of reckoning as well as a sense of possibility for global institutions of education. Prior to this global pandemic, systems of education faced broad and deep challenges to meet their intended objectives of promoting human flourishing, developing human capital, and supporting state- and nation-building across the globe. As Saavedra et al. (2020) have noted, “too many education systems are not delivering even basic skills for all children, let alone preparing them for the demanding world they will live in as adults” (p. 6). In this light, COVID-19 may rightly be understood as a “crisis within a crisis” (p. 12).

In times of calm, the breadth and diversity of the education sector are comparable to and no less consequential than those found in the governments and economies of entire countries. Indeed, the interconnectedness of education to all human institutions and its instrumental role in improving the quality of life for every learner makes teaching and learning crises immensely urgent. As reported by the World Bank, when the pandemic broke out in the first quarter of 2020, nearly 90% of the world’s learners were forced out of face-to-face instruction and into either remote or online schooling. When such a global event can so handily disrupt and continue upsetting systems of education across the globe, new reflections become necessary.



“ Schools are built to serve the purpose of education. COVID-19 has certainly disrupted the operations of millions of schools, often forcing their closure. While these closures have prompted innovation and institutional self-examination, the chance of large-scale, long-term changes is largely dependent on how we treat COVID-19 in education. If we treat COVID-19 as a short-term crisis, then whatever we do to help extend learning when schools are closed will be only temporary. As soon as schools are reopened, the status quo will be restored.”

Yong Zhao, 2020

Over the past decade, the international education community has called for systems of schooling and education that meet the needs of an increasingly VUCA world. As futures scholar Jennifer Gidley has suggested, schools need a new approach to education “designed to prepare young people for global uncertainty, accelerating change, and unprecedented complexity” (Gidley, 2016, p. 1). To that end, Gidley has identified four compelling “planet-sized” challenges facing education:

1. **The global challenge:** Multidimensional planetary crises, which include the environmental, psychological, socio-cultural, and politico-economic aspects.
2. **The epistemological challenge:** A crisis of thinking and meaning underlying global crises.
3. **The global youth challenge:** The psycho-social impact of global crises on young people.
4. **The educational challenge:** The failure of the industrial factory model of schooling to meet challenges and urgently produce radical change.

Each of these challenges is interconnected, creating complex and often unprecedented demands to listen, foster belonging, and take collective responsibility for educating and nurturing the younger generations. As human lives grow longer and the global economy rapidly changes, the nature of labor participation in the economy as well as the spectrum of educational needs faced by humans expand and evolve as well.

As Patrick and Mahoney have noted, “we will no longer be able to think about education as a linear and sequential set of experiences in formal schooling. Yes, schools will continue to exist and, especially in early years, will continue to play important custodial and caretaking roles for youth as they develop. However, we will need to begin decoupling learning and time, and allow greater flexibility for learning to happen anywhere anytime” (Casey & Patrick, 2020, p. 11).

In response to these challenges, we face bold calls to reimagine what schools could be and to generate possibilities for what effective teaching and learning might look like. We also face bold calls to rearticulate the narratives we tell about education and its purpose. Perspectives that situated education within the workforce demands of the 20th and early 21st centuries have generally received criticism for privileging a factory model that drew inspiration from factory or assembly-line work that prized compliance and efficiency (Gidley, 2016; Richards & Dede, 2020). This factory model and its emphasis on mass delivery of standardized instruction and isomorphic school structure and design, while perhaps effective for the intended purposes at the time the model was designed, are not likely to meet the complex and growing demands of the present, nor, indeed, the future.



Recently, a new conceptual understanding has emerged to address educational needs across an entire human lifetime. Richards and Dede (2020) have dubbed this model, which centers around the primary workplace of a given individual, the “Global Network.” The model positions human learning as an activity that takes place well beyond early childhood through to young adulthood, over the course of a person’s lifetime. Such a timeline includes multiple careers and many bouts of employment within each career phase. Participants in the Global Network will thus see a shift across workspaces and responsibilities, “from centralized to distributed organizations, from predefined to ad hoc work, and from a role-based to a consultant model of agency” (p. 30). A table outlining the Global Network model in comparison with legacy factory and office models is displayed below:

	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

Global Network model. Source: Educause Review, 2020.

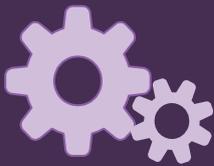
While this model for the future of digital learning is compelling—creating unique possibilities and demands for conceptual, structural, and operational transformation in the long-term—, nearer-term trends have also emerged that warrant notice and possible responses from governments and ministries of education seeking to stay ahead of the curve. In the 2021 Global Learning Trend report, FutureLearn highlighted 10 trends they see driving the education sector. Among these trends, they identified a noticeable shift toward individualization and increased learner agency, an emphasis on equity and social justice with respect to educational access and authority, and a growing need for formal and institutional learning to have direct application and benefits for workplace implementation as well as career and professional development.

What these near-term trends and the longer-term Global Network model suggest is that the future of digital learning will not simply be a matter of the technical changes in pedagogy or even in the technologies used. Rather, these trends suggest a larger transformation taking place with respect to the very purposes of education and the ways in which one’s agency within educational structures and cultures is being expanded in human-centered ways (FutureLearn, 2021). While the eventual implementation of this transformation will certainly vary across contexts, this report proposes a specific framework for the KSA based on the advances in innovation and service delivery currently taking place in the country. The following pages establish an innovation framework for future consideration within the KSA and highlight components of the framework that may foster ongoing innovations around the world.

A Framework for the Drivers of the Future of Digital Learning

Any discussion of the future of digital learning must acknowledge that the future is, by its very nature, unknowable. Thus, efforts to plan strategic directions or policies as well as efforts based on future projections are always subject to some variance. That said, heuristics are useful for identifying trends, anticipating needs, and generally grappling with uncertainty.

The emerging framework for the future of digital learning in the KSA focuses on how structures and practices of design, teaching and learning, and assessment might shape the future of innovative learning. In this framework, each dimension is explored through the lens of the conceptual (what), the practical (how), and the purpose-orientation (why). In the following sections, each framework dimension is thus investigated with respect to where innovations are taking place now, including a discussion of what these trends are and how or why their future application might benefit the future of digital learning.



Design

Disruptions and innovations in the structural and conceptual outlook of education



Teaching & Learning

Innovations in digital learning and pedagogy



Assessment

The best work, living at the intersection of clarity and surprise



Framework for the Drivers of the Future of Digital Learning

	Dimension 1: Design	Dimension 2: Teaching & Learning	Dimension 3: Assessment
WHAT?	<ul style="list-style-type: none"> Anytime, anywhere; ubiquitous Long-life/lifelong learning Deeper learning 	<ul style="list-style-type: none"> Personalized Gamified; gameful; game-based Learner autonomy & mastery 	<ul style="list-style-type: none"> Tied to authentic learning experiences Inquiry-driven
HOW?	<ul style="list-style-type: none"> Expand online learning Integration of job-embedded learning, learning-embedded jobs Emphasis on social-emotional learning 	<ul style="list-style-type: none"> Immersive technology (AR/XR/VR) Artificial intelligence Data-informed and data-driven 	<ul style="list-style-type: none"> Competency-based Making contributions beyond the school/institution Reimagined credentialing and achievement recognition and validation
WHY?	<p>Shift from education as a youth program to education as a holistic strategic driver for nations across citizens' entire life cycles.</p>	<p>Shift in teaching and learning needs from standardized to personalized and learner-driven, while new technologies drive innovation.</p>	<p>Future learning needs will emphasize skills and abilities related to 21st/22nd-century skills.</p>



Emerging Global Learning Trends

In addition to providing novel input from international experts, the findings of several recent analyses of emerging trends for teaching and learning were reviewed and contextualized. These prior studies have outlined important trends for the future of digital learning across various sectors of public life. Notably, the British open education platform FutureLearn identified emerging learning trends for 2021, which included several promising themes for the future of digital learning in the KSA:



ONLINE IS THE NEW NORMAL

Online learning will continue to proliferate as an accepted modality and is not simply a consequence of COVID-19.



NO MORE JOBS FOR LIFE

Humans will regard changes in jobs, careers, and sectors as normal, driving the demand for lifelong learning.



INCLUSIVITY IS ON THE UP

Accessibility and inclusivity are continuing an upward trend, driven by learners' demands.



GEN Z LEADS THE CHARGE

Younger generations are driving the demand for online learning and will continue to do so.



YOUTH MOBILIZING ON SOCIAL MEDIA

Social media has become a trusted space for connecting with others, advocating for causes, and learning.



WOMEN TRUST EDUCATION

Women are increasingly taking online courses and believe in the value of education to make the world a better place.



PROFESSIONALS WANT A CAREER BOOST

Online learning can advance one's professional credentials, especially for those whose opportunities are limited.



BROADER CREDENTIAL ACCEPTANCE

Micro-credentialing, badging, and stackable qualifications are changing how we recognize qualifications.



SELF-DEVELOPMENT BECOMES CRUCIAL

Mindfulness, self-care, mental health, and physical health are emerging as key foci across the globe.

Elsewhere, the Consortium for School Networking (CoSN) has identified three key strategic drivers and accelerators of innovation that will support the future of learning: (1) personalization, (2) social and emotional learning, and (3) increased learner autonomy (CoSN, 2021). Personalization is accounted for across all three dimensions of the framework as it has applicability among design, teaching and learning, and assessment considerations for the future of learning. Likewise, social and emotional learning as well as learner autonomy show up in the discussion of each dimension.

INSIGHT FROM KSA EXPERTS

What are the top DESIGN trends and innovations you expect or hope to see in online learning over the next five years?



Mounira Jamjoom
CEO & Founder, Aanaab.com

“The Kingdom is part of a global challenge that will be facing the world in the next two decades: the increase in numbers of global learners. The expectation is that by 2050, the world will need to accommodate another 2 billion learners. The scale, in addition to the overall increase in enrollments, the unbundling of higher education, and the disruption in university tuition, will drive the need for more creative online learning models. I don’t believe that asynchronous learning is a thing of the past, nor is cohort-based learning the future. I believe the online learning platforms/institutions that succeed will be those that accommodate a myriad of learning approaches with flexible models.”

DIMENSION 1: DESIGN

Exploring Disruptions and Innovations in the Structural and Conceptual Outlook of Education

This section discusses the design of future education systems and institutions. As systems of education are largely functions of the societies in which they operate, any discussion of the future of digital learning will necessarily be connected to the future of other local political, economic, and cultural institutions in each context. However, the current moment presents an opportunity to reconsider the fact that institutions of education, including schools themselves, are not wholly predetermined but rather designed. To this end, Richter and Allert (2017) have noted that the design of systems of education ought not be fixed and should instead be recognized as contingent and subject to reimagination and **redesign**:

Education and educational systems are artificial phenomena in the sense that they emanate from human intervention and effort. Irrespective of whether we look at policies, curricula, instructional measures, tools, networks, or environments, educational processes are essentially shaped by man-made inventions and artifacts. As a consequence, educational processes are not uniform and lasting but contingent on the socio-material, and historical conditions in which they take place. (p. 1)

As products of human design and creation, schools are subject to critical interrogation, review, reimagination, and redesign. To this end, the ways in which institutions have been designed may always be seen as causes for critical inquiry and reflection. In the current context of COVID-19 and the associated global disruption, the critical inquiry and interrogation of education systems is thus imperative to addressing structural deficiencies that may have otherwise evaded notice when such crises were not present.

In this section, two key concepts emerge. First, **anytime, anywhere learning**, in association with the concept of ubiquitous learning, explores how future trends indicate a likely expansion toward online, digital, and blended learning. Second, the notion of **long-life learning** is introduced as an innovative next step arising from the recent concept of lifelong learning. Both are explored through the conceptual framework driving this study and connect to the questions of **what?—how?—and why?**



Anytime, Anywhere Learning (Ubiquitous Learning)

The expansion of anytime, anywhere learning will continue to be an important driver of instructional innovation and necessarily requires widely available access to the internet and internet-enabled devices to reach learners. While digital divides and inequitable access to high-speed internet has been a decades-long challenge across the globe, COVID-19 revealed the ways in which many nations were unprepared to scale online and digital learning. To realize greater access, nations and entire regions need to invest in infrastructure and devices that promote digital access for all. Furthermore, professional development to support these services is needed.

Meanwhile, learners are continuing to pursue online education and even looking to non-traditional and non-institutional sources to augment their learning. As social media platforms, content sharing platforms, and open educational resource libraries expand and evolve, the concepts of how and where learners study also diversify.

The field of **ubiquitous learning** suggests that learning can be done anytime and anywhere. Ubiquitous learning, or u-learning, “takes advantage of digital content, physical surroundings, mobile devices, pervasive components, and wireless communication to deliver teaching–learning experiences to users at anytime, anywhere, and anyway” (Cárdenas-Robledo & Peña-Ayala, 2018, p. 1). As a broad concept, u-learning may have a profound influence on traditional notions of school and formal education, for example, the assumption that children’s education must take place contemporaneously with traditional adult work hours. The notion of ubiquitous learning creates flexibility for how and when learning might take place and has implications for the physical location, time of instruction, social interaction, assessment strategies, domains of knowledge, and learner autonomy. Emerging technology provides many examples of opportunities for ubiquitous learning. For instance, as the Internet of Things expands and proliferates, so too will the possibilities for using connected devices to curate instruction. As such, access to information, data, and learning content will be further pushed beyond the bounds of classrooms and formal learning settings. Anywhere/anytime or “ubiquitous” learning thus begs us to rethink teaching as an (in)formal activity distributed broadly across devices, platforms, and environments.

As consumer technology develops new relevance for educating users, structures that support out-of-school learning will likely increase flexibility and further the progress of innovation. Current and future possibilities in this realm include wearable technology, smart devices, and further-distributed mobile connectivity. Some models, including hub-and-spoke models for education, imagine settings where learners may only attend their school proper—considered a “hub”—one or two days per week. At other times, learners may be learning at the “spokes” or spaces outside of a school, where they have been commissioned to learn in situ through apprenticeship or internship opportunities.

Ubiquitous learning will also expand through the further implementation of online learning. With rich media content, including audio and video productions, expanding and being stored in digital libraries for on-demand consumption, access to schooling can be made always available or “open.” Through wearable technology, learning will expand beyond the form factors and screens of more conventional computing devices, providing learners opportunities to connect, explore, and augment immersive data across material objects, artifacts, and landscapes. Anytime, anywhere learning will thus require a fundamental shift in thinking about the nature of schools and institutions, learning environments, and curricula.

Long-Life Learning

The notion of lifelong learning has been prevalent in educational discourse for several decades (Candy, 1991; Day, 2002; Field, 2000). Traditionally, it has been understood as a necessity for the continued development of skills and knowledge in an ever-changing world. However, the notion of **long-life learning** has recently emerged as a reconceptualization for thinking about our expanding lifespans and how humans must prepare to address those moments where new opportunities to learn are not only possible but necessary. To accommodate this reality, formal education and the availability of structured learning experiences must extend beyond familiar forms of K-12 or even higher education experiences.

As US-based education innovator Michelle Weise has noted, “Long-life learning is about anticipating that we will all need to navigate a longer, more turbulent work life. If early baby boomers are already experiencing 12 job changes by the time they retire, we may have to prepare for 20 or 30 job transitions in the future. To stay competitive in the workforce, we’ll all need to think of ourselves as working learners, always flexing between working and learning or juggling both at the same time.” (Weise in Griffin, 2021, para. 5). While the workforce implications are readily apparent, people living longer lives in rapidly changing social contexts will also need to develop the interpersonal and intrapersonal skills to adapt and thrive.

Currently, most of the world does not provide robust, formal learning opportunities beyond young adulthood for most sectors. However, in a rapidly changing world where innovations and disruptions to whole sectors of the economy are taking place, mid- and late-career adults will need continual training and learning experiences to adapt and succeed. Creating education pathways—both formal and informal—will be necessary for nations to maintain their global competitiveness. This is particularly important when we think about what it will mean for human longevity. As Weise notes, “we are seeing people stay in the labor market for longer. The concept of a 100-year life, or a 150-year life, suddenly makes our systems look deeply inadequate. If we get a college degree, it seems unlikely that two or four extra years of learning is really going to last us a 60- or 80-year work life” (in Buchan and Woods-Hale, n.d., para. 8).

As Dede and Richards (2020) point out, shifts toward long-life learning will require both learning providers and learners “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” (p. 7). We will have to creatively think about learning pathways that don’t simply stop at young adulthood but rather extend to learning experiences across a person’s increasing lifespan and lend every person the agency to lead a fulfilling, self-realizing life.



INSIGHT FROM KSA EXPERTS

What are the top DESIGN trends and innovations you expect or hope to see in online learning over the next five years?



Dr. Hajar Binasfour
Deputy Director General for
Customer Success,
NeLC, KSA

“Currently, the entire online learning system works in silos. The ecosystem approach is missing. Platform thinking would match the supply with the market needs for learning, upskilling, and reskilling. The programs and courses are bundled together so that they cannot be contextualized and reused; hence, I see a more modular approach, where unbundling could be an innovative solution. Learners should have relevant opportunities to learn with flexible pathways and obtain digital credentials that are recognized by the industry and academia. Learning should be more adaptive and data driven.”



TOP DESIGN TREND: ELEARNING Anytime, Anywhere

“eLearning (whether blended or online) is flexible, cost-effective, convenient, and suitable for technology-oriented younger generations living in the digital 21st century. Students and teachers are increasingly comfortable using technology as part of their daily lives. Learning can happen anywhere and at any time. Technological advancements took learning to new horizons; learning is no longer confined to school settings. Technology is a major enabler of many significant trends in education.”

Bader A. Alsaleh, Consultant KSA Ministry of Education

DIMENSION 2: TEACHING & LEARNING

Innovations in Online Learning and Pedagogy: Research-Based Trend Reports

As the design for how, when, and where learning takes place continues to expand, the nature of the teaching and learning takes place (“what”) will also expand. This section highlights a few trends that should inform the ways in which future pedagogical innovations shape what learning looks like across the globe. While the practices featured here involve significant training, resources, and infrastructure to implement, their impact can be best realized iteratively through basic development over time.

Engaging Learners

Future directions for teaching and learning will likely include an evolution in what meaningful and engaging interaction between educators and learners looks like. As much of the world learned in 2020, the emergency pivot toward online learning often resulted in educators scrambling on the fly to translate or transpose instruction into available online learning spaces, such as learning management systems (LMSs) or course websites (Jaggars, 2021). As the world moves toward a more strategic vision for the future of digital learning, human-centered engagement will be at the fore, and educators will be called on to do more than simply digitalize their curriculum and instruction (CoSN, 2021). As Mehall (2020) has noted, purposeful interpersonal interactions—including social, instructional, and supportive interactions—in online learning that extend beyond the mere attempt to replicate or translate in-person learning interactions into a given online environment have been associated with positive learning outcomes, including academic achievement and satisfaction.

“Personalization, game-based learning, 4.0 technology—such innovations will make online learning in the KSA more engaging and motivational.”

**Dr. Ali Alshammari, Dean of eLearning,
University of Tabuk**

Deeper Learning

Deeper learning is a pedagogical movement and emerging body of conceptual knowledge that seeks to help learners develop a rich understanding of the underlying structures or ideas in a specific discipline or across disciplines, going beyond mere surface-level knowledge. As Harvard professor Jal Mehta has noted, “deeper learning tends to emerge at the intersection of mastery, identity, and creativity. Mastery is developing significant knowledge and skill; identity is seeing yourself as connected to doing the work; and creativity is not just taking in knowledge but doing something in the field. When those three elements come together, it often yields deep learning” (Mineo, 2019, para. 8). The impetus for deeper learning emerged from the Hewlett Foundation in the mid-2010s as “an umbrella term for the skills, dispositions, and knowledge that learners must possess to succeed in 21st century jobs and civic life” (ORSImpact, 2013, p. 2).

The figure below shows six competencies the Deeper Learning Hub has identified as essential for pursuing deeper learning in K-12 education.



The six deeper learning competencies. Source: <https://www.deeper-learning.org/>.

Recommendations from the Alliance for Excellent Education for increasing deeper learning at the instructional level include the following:

- Design curricula with flexible learning opportunities for learners that provide engaging ways to demonstrate knowledge and higher-order skills.
- Partner with employers or other organizations to develop learning activities that allow learners to make connections to the real world.
- Collaborate with teachers and experts (as needed) to design comprehensive approaches that engage learners in a full range of deeper learning skills.
- Establish a vision for teaching and learning that supports a school culture in which learners develop critical thinking, problem-solving, collaboration, communication, and higher-order skills.
- Reflect on existing spaces that can be used to support learner collaboration, small group meetings with teachers, and technology and other equipment.
- Build the capacity of school leaders and educators to lead a creative team that can design content, lessons, activities, and assessment to support deeper learning.

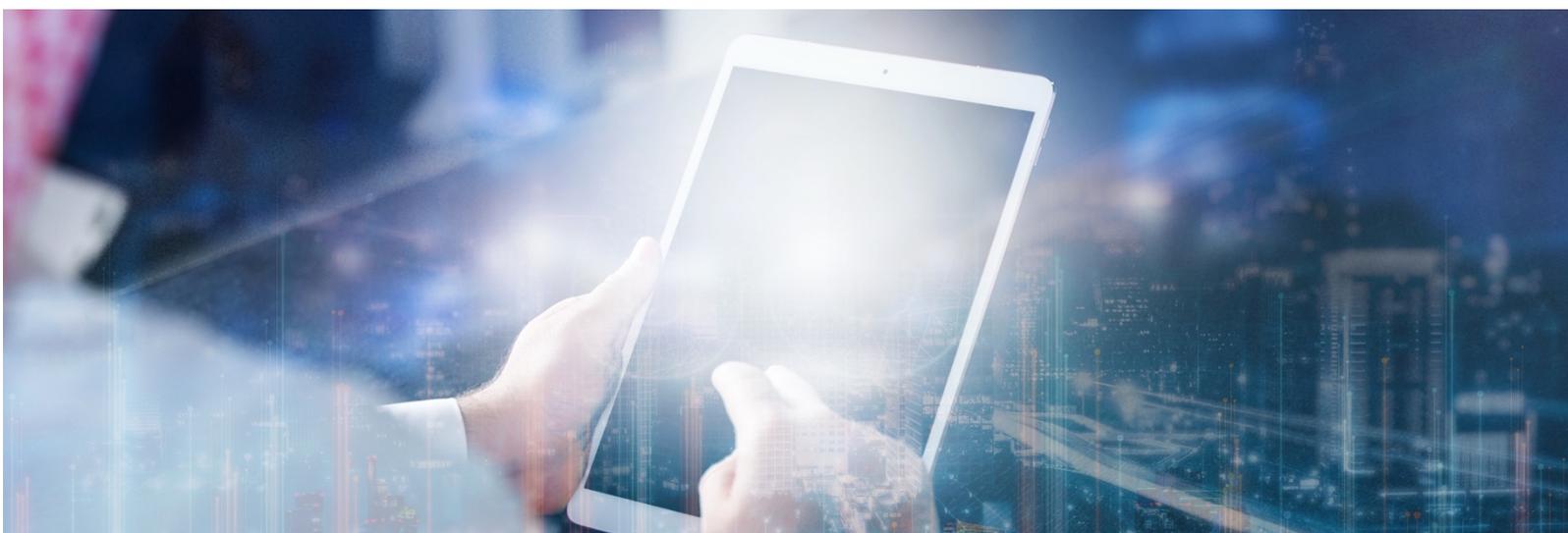
Personalized Learning

Personalized learning represents an approach to teaching and learning based on the notion that each learner’s educational experience should be customized around their individual needs with the aim of empowering and engaging them. As the US-based personalized learning firm LEAP Innovations has shared, by “centering learners’ educational experiences around their specific needs, strengths, and interests, personalized learning fundamentally inverts the traditional ‘one-size-fits-all’ classroom model” (LEAP Innovations, n.d.).

However, personalized learning is not a new development. As Lockett (2017) has noted, “the modern push toward personalized learning started in the 1960s and 70s, when some teachers began practicing what they called ‘individualized instruction’” (para 2). Recent notions of personalized learning have tended to focus on LEAP Innovations’ three grounding principles of personalized learning:

1. Every learner can succeed with support that is customized to their interests and needs.
2. Every learner brings strengths and talents to the learning environment/context.
3. Learner agency is essential.

Personalization can include individualized learner-centric opportunities and systems that provide on-demand information for educators and learners alike. In the US, for example, Engelbrecht, Llinares, and Borba (2020) have noted that the appearance (or the need) of personal learning environments (PLEs) and personal learning networks (PLNs) are making way for hyper-personalization/engineering and that “the official ‘curriculum’ is currently playing a role that is overemphasized. Our modern learners want a bigger say in how they are taught and what they are taught” (p. 838). Emerging research suggests that adopting personalized learning in online environments has benefits for learners spanning various age ranges. A research synthesis of 71 empirical studies on personalized learning conducted between 2006 and 2019 found that most personalized learning trials—particularly where the learning was supported by technology—yielded positive results for academic outcomes, learner engagement, attitude toward learning, and meta-cognitive skills (Zhang et al., 2020). In higher education, adopting personalized learning principles and approaches in an online course has increased learners’ autonomy, competence, and intrinsic motivation (Alamri et al., 2020). Similarly, Arnesen et al. (2019) found that introducing personalized learning in online and blended setting led preservice teachers to “feel more confident in their abilities to implement personalized learning pedagogies” in blended K–12 environments (p. 271).



INSIGHT FROM KSA EXPERTS

What are the top TEACHING & LEARNING trends and innovations you expect or hope to see in online learning over the next five years?



Dr. Bader A. Alsaleh

Consultant at the Ministry of
Education Office, KSA

"New teaching and learning methods in the 21st century are innovative in nature and enabled by technological advances. One of the important advantages of technology is that it revolutionizes teaching and learning process, saves time and effort, and increases efficiency. Gamification, live video interaction, simulations, podcasts, and virtual laboratories are new pedagogical approaches supported by technology."

Games, Gamification, & Gameful Learning

Gamification is “an approach to motivating learners by incorporating game elements into the learning environment” (University of Florida, Center for Instructional Technology and Training, n.d.). In gamified learning, game mechanics can be used as motivational tools to encourage ongoing engagement and achievement among learners.

The notion of gamification is not new and has been heralded as the future of education for more than half a decade (Frith, 2015). However, as the popularity of esports and online gaming has grown, gamification in learning has continued to hold a special place of promise regarding what learning could look like in the future. In the education literature, research has shown how games themselves leverage scholarship on human motivation and psychology to more effectively attract and entertain players (Patel, 2020). As Gee (2003; 2014) has noted, games incorporate numerous learning principles and values, including fostering collaboration and teamwork; facilitating autonomy and choice; supporting just-in-time learning; and nudging players to work at the peak of their abilities, knowledge, and skills.

However, the emerging picture for the future of digital learning is to standardize and further incorporate elements of games into the normal design of learning experiences for learners of all ages, disciplines, and spaces. As Werbach and Hunter (2020) have noted, “gamification is mostly seen as just good design practice. For instance, having virtual fireworks explode on the screen of a health app when the user hits a meaningful goal is a powerful motivator by itself” (p. xix). As increasing numbers of game elements continue to make their way into learning experiences, the added dimensions of engagement are likely to also progress.

Novel opportunities for effective learning through experiences that feature elements of games and gaming continue to emerge. In one instance, American university educators successfully employed a virtual “escape room” to engage learners in simulating real-world clinical practice in a nutrition course (Ross et al., 2021). Such strategies can leverage and expand micro-credential and competency-based reward structures that recognize the agency of each individual learner.





SPOTLIGHT

Gameful Pedagogy

At the [Center for Academic Innovation at the University of Michigan](#), educators and staff have developed a twist on the traditional notion of gamification, which they describe as referring to “adding game elements to a course, such as leaderboards, badges, trophies, and achievements, without making underlying changes to the design of the course.” Instead, they are beginning to articulate what they call gameful pedagogy, which they say, “goes farther building game elements into the design of the course, such as building up points from zero, user choice, immediate feedback, learning from failure, and transparency.”

As a part of this gameful pedagogy, they developed the [GradeCraft LMS](#). GradeCraft features include a points planner, which allows learners to set their own learning goals and chart their own pathways through a course. The platform also includes leveling, badging, and reporting and analytics to support and guide scaffolded learning. You can learn more about GradeCraft [here](#).

INSIGHT FROM KSA EXPERTS

What are the top TEACHING & LEARNING trends and innovations you expect or hope to see in online learning over the next five years?



Dr. Bandar Alamer
Deputy Director General for
Partnerships and Investment, NeLC,
KSA

"With collaborative learning, technology has made it possible for students to connect with others wherever they are, making idea exchanges and interaction with peers outside of school easy and efficient. Students and teachers connect, discuss, share their opinions, and act upon situations collaboratively. In short, eLearning tools enable collaboration among students.

With problem- and project-based learning, teachers are embracing new technological tools and using them within their teaching practices. These tools help to contribute to new learning approaches and meet learning preferences. Technology provides easy access to multiple eLearning sources and expertise."

Augmented, Virtual, and Extended Reality

Consumer-level augmented reality (AR) and virtual reality (VR) technologies have continued to show great potential for innovation in their application across numerous aspects of daily life. In the context of education specifically, the adoption of AR and VR experiences in learning environments has positioned extended reality (XR) as an emerging trend for engaging learners and elevating collaboration beyond the limitations of any one physical environment. In a systematic review of the implementation of inquiry-based learning through AR, Pedaste et al. (2020) found that cognitive, motivational, and even emotional learning goals could be successfully supported by augmenting physical reality with digital information and interactivity. Collaboration skills in both indoor and outdoor settings also improved under AR conditions. Such findings provide new opportunities for experiential learning because they allow learners to find connection through inquiry, interest, and shared experience rather than the more conventional grouping of learner cohorts by age and proficiency.

Perhaps the most ubiquitous of the three technologies, AR augments environments with additional information but may not allow for real-time feedback. This interactivity is now commonly built into smartphones in the form of the image recognition technology used to scan quick-response (QR) codes or link objects to search engine results via Google Lens. Virtual reality, on the other hand, has a history that dates back as far as the mid-20th century and generally includes experiences that are visually and auditorily distinct from real-world environments, presented through head-mounted screens, headphones, and haptic clothing or controllers. Extended reality comprises broader combinations of AR and VR technology and most comprehensively addresses the future learning contexts as “a blend of technologies used to influence the human perception of an experience” (Ziker et al., p. 56). Using an interplay of sensors to track motion and changes to the human body with digital overlays provides a data-enhanced version of reality that may include additional auditory, visual, haptic, and other sensory feedback in real time. Rather than asking, “What is the future of education in AR/VR/XR?” educators and leaders can benefit from thinking along the lines of XR and the contexts that arise as virtual experiences become increasingly multimodal, affecting the material world.

The HoloLens 2 provides a striking example of XR with its “shared wall” that allows interactions with people and objects placed in distributed environments. When in a shared space, HoloLens 2 users can interact with live people—not just virtual avatars—in real time. Another example can be found in volumetric livestreaming, with which an educator can stream 3D figures into a space, fully embedding them within the realities of the physical learning environment. Thus, the educator and any other featured objects appear not as pre-produced content but as XR figures that accentuate the live interactions taking place in each room. Where shared objects exist among learning spaces, learners and educators can together manipulate physical material in virtual space.



In the context of art education, XR functionality may dramatically change how learners “make” and “study” art online. Rather than settling for “take a picture, send a picture” practices, simulating an educator looking over a learner’s shoulder while they work, watching them create, and giving them extemporaneous feedback is becoming increasingly possible as a result of increasing fidelity. When both an educator and learner engage in volumetric live streaming, where space and time become shared due to the use of replica objects, the learner could, for example, observe the educator pointing at a canvas as if all objects and humans shared a material space. In these contexts, art can be discussed in depth and created collaboratively while participants occupy separate physical locations.

While VR has existed for decades, the more recent maturation of the technology has led to greater quality and interoperability at a lower price point. With much of the requisite functionality to support VR and AR being present in standard smartphones, the prospect of ubiquitous access to XR learning experiences indeed appears closer than ever. Further, the availability of VR- and AR-ready devices, the open-source nature of many XR development assets, and the familiarity of modern learners in interacting with social worlds through digital avatars encourages new risk-taking among educators and learners alike. Where Second Life Islands and Minecraft were once used for educational purposes, a metaverse that combines digital and physical experiences seems like a compelling next step for educators who endeavor to create relevant high-quality experiences for learners anywhere.

At the same time, the spectrum of what is immediately possible for XR remains bound to constraints in hardware and data transfer infrastructure. While handheld devices mediate much of our experience in the world, the will to leverage this technology for teaching and learning purposes remains tethered to questions of device reliability and compatibility. As mobile computational power increases, hardware design improves, true software interoperability materializes, and the cost of entry diminishes, the prospect of scaling XR learning experiences will grow exponentially. While we currently have the technological capacity to achieve live 3D volumetric streaming, it requires unwieldy learner scaffolding and costly equipment as well as heavy processing power to successfully produce—never mind the cloud computing and security protocols that need to exist.

However, we are not so far from a future of incredible possibilities for simulation, immersion, and exploration. Haptic sensory experiences continue to evolve, enabling learners to feel simulated physical feedback when they interact with virtual objects. Beyond the implications XR has for formal education in medicine, architecture, engineering, art, and other disciplines that benefit from hands-on interaction with space and shape, this technology may become truly revolutionary when it extends the boundaries of embodied reality. For example, experiences that would otherwise be too dangerous or inaccessible for some learners (e.g., consider the limits of teaching a predominantly visual area of study like art history to vision-impaired individuals) can be made possible through the digital and haptic technology of XR.

The KSA, and indeed every country, will benefit from re-evaluating the role of virtual simulations, digital overlays, and immersive experiences for teaching, learning, and assessment as they further infiltrate our daily lives. Career architects are already allowing clients to walk through virtual renderings of their dream homes, and QR codes have dramatically altered the way many of us interact with menus or traditionally printed materials in public. With Artificial Intelligence (AI) being embedded in the consumer electronics we use and escalating in its sophistication to the point where AI-generated content produces outcomes that are consistent with human-designed alternatives, barriers to XR diminish more each day.

Artificial Intelligence

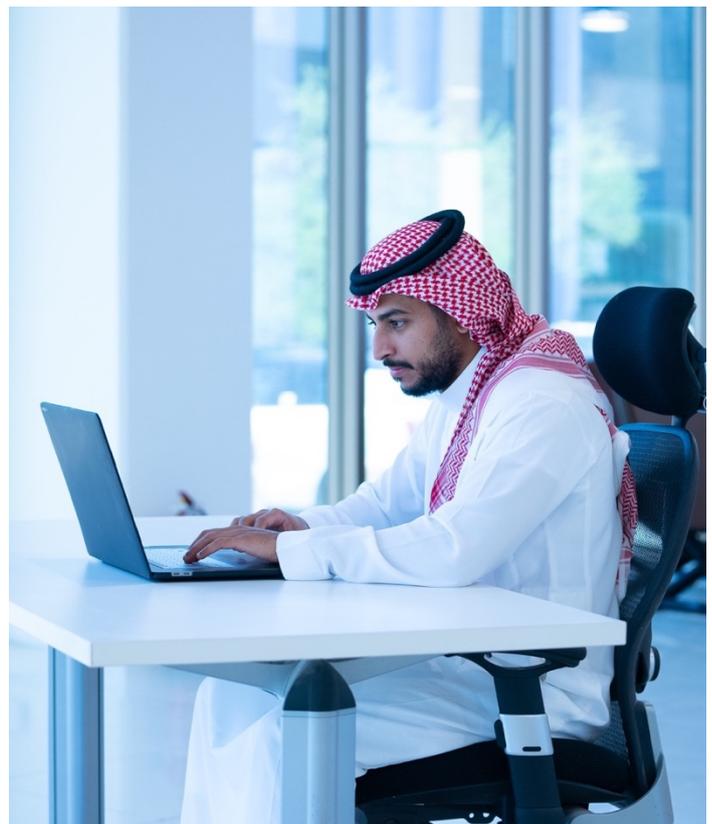
AI is becoming a priority for unlocking future global learning potential. As His Royal Highness Prince Mohammed bin Salman bin Abdulaziz, the Crown Prince, offered during the 2020 Global AI Summit—organized by the Saudi Data & AI Authority—nations are just beginning to “unlock the value of data and AI in order to build knowledge-based economies and advance our present and future generations” (Minevich, 2020, para. 1). The capacity of humans to distribute cognition and computational tasks to algorithms not only increases the efficiency by which we can traverse large swaths of information; AI also broadens conceptions of what to expect in terms of day-to-day convenience and the utility of connected devices.

Roschelle et al. (2020) have noted that there is no definition of AI universally accepted across its use cases. However, there are three descriptive analogies for AI that seem worthy of adoption:

1. An ambitious leading edge of computing.
2. A set of rapidly advancing specific capabilities.
3. A toolkit for synthesizing and exploring possible futures.

Aspects of each of these descriptions can be found in the future of digital learning. Roschelle et al. (2020) outlined the layers as follows: “First, the layer where computational intelligence can be brought to bear on educational challenges as an additional resource. Second, the layer where specific emerging capabilities can be engineered into solutions for specific education problems. Third, a layer where this toolkit can enable us to imagine new futures for learning, teaching, and assessment for learning and teaching” (p. 2). All three areas enhance the activities, expectations, and breadth of the results that we might associate with educational practice.

Indeed, the utility of AI has already been deployed in both higher education and in K–12 learning. The traction gained by AI in teaching and learning can be observed in the expeditious processing and coding of massive data sets in research as well as the modest novelty of predictive assistance in typing words into a digital page. Another advancement in AI projected to gain a growing foothold in education is the emergence of low- and no-code machine learning (ML). Low- and no-code applications provide platforms for users to become developers and create a range of complex programs that do not require knowledge of a specific programming or coding language. Rather, an AI-powered ML platform can take the natural language input of the user, decipher the intent as well as the context of the desired program, and



write the code on their behalf. The Future Today Institute has indicated in their published report entitled Tech Trends 2021 (2021) that low- and no-code programs, such as Apple's Create ML and Google's AutoML, are creating efficient ways for business enterprises to structure their data for analysis in ways that were previously difficult or required specific ML expertise and skillsets.

The UNESCO guide called AI and education: Guidance for policymakers (Miao et al., 2021) estimates that AI in the education sector will be worth approximately \$6 billion USD by the year 2024. Thus, while the broader field of AI in education is still maturing, platforms and applications that can be deployed to assist educators in their roles and improve education may be beneficial as areas of investment. For example, areas of investment could include the intelligent tutoring systems that have been in development for nearly 40 years, such as ALEKS, or online adaptive learning systems that promote high-tech high-touch implementations.

Natural language processing AI capabilities also offer enhanced learning tools/applications for educational settings that can promote reading and language learning, such as Duolingo, AI Teacher, Babbel, etc. To gain clearer insight into possible areas of investment, it would be highly advisable to review the AI and education: Guidance for policy-makers publication from UNESCO and examine the five areas of AI in education in close detail. It would also be helpful to invest in technologies that will complement an organization's areas of strategic need, while keeping in mind that these new technological advancements pose data, privacy, and equity risks as they mature in the market and consensus forms around their effectiveness.

Taking a closer look at some emerging practices of AI in education, UNESCO has created an AI framework based on the Beijing Consensus on Artificial Intelligence, which was the product of the International Conference on Artificial Intelligence and Education in 2019. The Beijing Consensus on Artificial Intelligence and Education (UNESCO, 2019) establishes recommendations that reaffirm a broader call to retain a humanistic approach when using AI in education and ensure the technologies deployed build upon existing human agency, protect human rights, and foster the sustainability of human-machine collaborations. The Beijing Consensus also details specific recommendations on AI in education for policymakers in the following areas:

- AI for education and management delivery.
- AI to empower teaching and educators.
- AI for learning and learning assessment.
- The development of values and skills for life and work in the AI era.
- AI for offering lifelong learning opportunities for all.

These recommendations, while reasonably aspirational, call for critical reflection from the KSA—and indeed all nations—when implementing advances in AI technology. Where automation and machine learning may offset the cognitive load of educators, learners, and generally anyone using a connected device in completing tasks, the nature and breadth of human agency will undoubtedly be structured and influenced by the information that algorithms choose to display. Regarding educational assessment, a spectrum of early experiences, arising from the limits of proctoring software in accurately

reading human behavior and the capacity of AI to write increasingly acceptable essays on behalf of learners, have already shown the importance of anticipating the human outcomes, challenges, and risks when relying on AI.

As digital technologies augment human learning with AI or extend the scope and experience of reality, parallel considerations of ethical practice must remain a priority. Steele et al. (2020) have noted that while some designers have expressed awareness of the need to be learner-centered, educationally aware, and ethical in their development of AR/VR curriculum and products, industry-wide and/or government-level standards related to the ethics of these technologies do not yet exist. As both AI and XR technologies become an ever-more integral part of delivering learning at scale, innovation in how we vet quality, evolve practice, and assess engagement—particularly on a learner-by-learner basis—should be a core commitment when adopting technology that can adapt to as much as it can condition human behavior.



DIMENSION 3: ASSESSMENT

In this section, the trends and possibilities related to the ways in which learners are assessed, the credentials and certifications they earn, and the ways in which they might assume the ownership and/or transferability of those certifications through emerging blockchain technology are discussed. This section also details the connections among the dimensions of the framework, leading to a set of recommendations for future consideration.

INSIGHT FROM KSA EXPERTS

What are the top ASSESSMENT trends and innovations you expect or hope to see in online learning over the next five years?



Dr. Bader A. Alsaleh
Consultant at the Ministry of
Education Office, KSA

"Assessment is a critical component of the online classroom. It provides students with an idea of their progress in a course, identifies individual strengths and weaknesses, and ultimately serves as the measure of whether students achieve the course's learning objectives. I would like to see more emphasis on formative assessment, whether graded or ungraded. Also, I would like to see more alternative assessment such as authentic or performance-based evaluation that requires students to apply what they've learned in a new complex circumstance or situation using simulation that mimics the real world. I would like to see teachers use rubrics that describe different levels of student performance, not just to grade assignments but also to better communicate expectations, encourage self-assessment, and foster engagement."

Learner-Owned and Inquiry-Driven Learning

The ways in which learners demonstrate and share their knowledge as well as their effort in learning are primed for innovation via the promotion of learner agency and autonomy in assessment. As CoSN (2021) has suggested, educators can empower learners by providing them with freedom of choice and encouraging them to choose their own learning pathways and determine how they want to collaboratively learn.

One possible step toward learner ownership in learning is to support the creation of robust assignments that demonstrate evidence. This accounts for what education consultant and innovator Alan November (2015) refers to as the transformational six (questions):

1. **Did the assignment build capacity for critical thinking on the web?**
2. **Did the assignment develop new lines of inquiry?**
3. **Are there opportunities for learners to make their thinking visible?**
4. **Are there opportunities to broaden the perspective of the conversation with authentic audiences from around the world?**
5. **Is there an opportunity for learners to create a contribution (purposeful work)?**
6. **Does the assignment demo “best-in-the-world” examples of content and skill?**

When assessment strategies are learner-driven and inquiry-based, a strong connection is made to long-life learning. As Michelle Weise recently noted, one real opportunity for educators engaging in long-life learning “is to push the boundaries of what is possible with the things that are in their control. There is great reinvention possible when it comes to moving away from content delivery to problem-based inquiry” (Griffin, 2021, para. 8). Assessments that are based not merely on responding to a test but demonstrating practical knowledge and abilities create opportunities for learners to apply what is learned beyond the classroom context.



Innovation in Certifications and Degrees

As **flexible pathways** for pursuing education expand, the quantity and type of certifications and credentials offered may expand as well. As we have seen, the notion of unbundling (Craig, 2015) has taken root in higher education. Indeed, corporations across the globe are taking on the task of skilling their own workforces directly, supplanting traditional college degrees as a requirement for employment and instead seeking narrower or more specific demonstrable skillsets.

These disruptions and current trends suggest that the number of credential and degree types will expand in the future, including **micro-credentials**, such as badging and certificates, on top of traditional degrees. Furthermore, non-institutional actors will continue to expand just-in-time learning options with stackable credentials, course completion certificates, and badges that allow learners greater flexibility in bundling finished coursework toward a greater degree or endorsement.

Future learners may bundle their portfolio of demonstrated learning and skills with a mix of badges, credentials, certificates, and possibly degrees. As these portfolios emerge, **credit recognition by industry and academic** actors may rely on new platforms, such as blockchain technology, to secure and verify the authenticity of credentials across work and school contexts. Such a future does not supplant the need for formal education—far from it. Instead, this future posits that robust access to learning and skill development and, by extension, access to the future global economy, has expanded pathways across disciplines, institutions, and industries. Accordingly, nations must seek to expand how they provide credentialing and learning pathways.

Effective long-life learning generally depends on one's self-motivation in the pursuit of knowledge for personal or professional gain over their lifespan. This continued education falls outside of the traditional pipelines and programs of study and serves as a gateway to a career or vocation. With the increasing global ubiquity of access to information, knowledge, and upskilling provided by the expanding global knowledge base of interconnected platforms, organizations, and open education, people today have far more opportunities to engage in long-life and lifelong learning activities than at any other time in human history. Online learning, social media, and streaming services have made the technical process for gathering information and knowledge more accessible than ever, broadening the potential to reach learners where they are, on their schedules, and through the communicative modes that best engage them. YouTube's status as the world's largest digital education platform emphasizes the will and capacity of learners to seek and self-direct education that meets their needs.

Universities have not ignored the growing demand for variety and flexibility in digitally engaging learners. Many courses and programs offered through Coursera, for example, are provided by partner universities from around the world. Some universities are even branching out on their own to capture this broader net of potential learners who have not explored adult learning opportunities within traditional university settings or programs. Given the cost of most US higher education institutions, the traditional options for adult learners to join courses are cost and effort prohibitive, and some universities are looking to create new life-of-the-learner-centric learning experiences.

One such university, Arizona State University, has implemented a university-wide initiative to create an educational ecosystem to provide learning experiences to all, offering a ladder for social and economic opportunity that is responsive to the ever-changing needs of the workforce (Arizona State University, n.d.).

Investments in lifelong credentialing opportunities provide a pathway to upskill members of a workforce quickly, credibly, and cost-effectively. As an example, Udeemy, an online marketplace for learning materials, was born out of the recognition that new employees of technology companies, such as Google, were often graduates from four-year university programs but lacked specific skills and knowledge. Udeemy began to offer company domain-specific educational experiences allowing individuals to develop the necessary set of skills and knowledge to be effective employees and require less on-the-job upskilling. These job-specific skills often fall outside of the range of curriculum in traditional university programs yet offer economic mobility to learners since unbundled learning platforms partner with companies that seek to hire candidates with specific skillsets.

Micro-credentials have also been used to address specific areas with teacher-educator shortages. Many local education agencies have experienced significant educator shortages over the past several years, an issue made even more severe by the onset of the COVID-19 global pandemic. During such shortages, it is common for professionals to seek emergency or even temporary educator certifications. Micro-credentials have been leveraged in these situations to demonstrate subject area competency or skill development. Even when used outside of “urgent” geo-social-political situations, micro-credentials can provide strong pathways to growing an educational workforce.



INSIGHT FROM KSA EXPERTS

What are the top ASSESSMENT trends and innovations you expect or hope to see in online learning over the next five years?



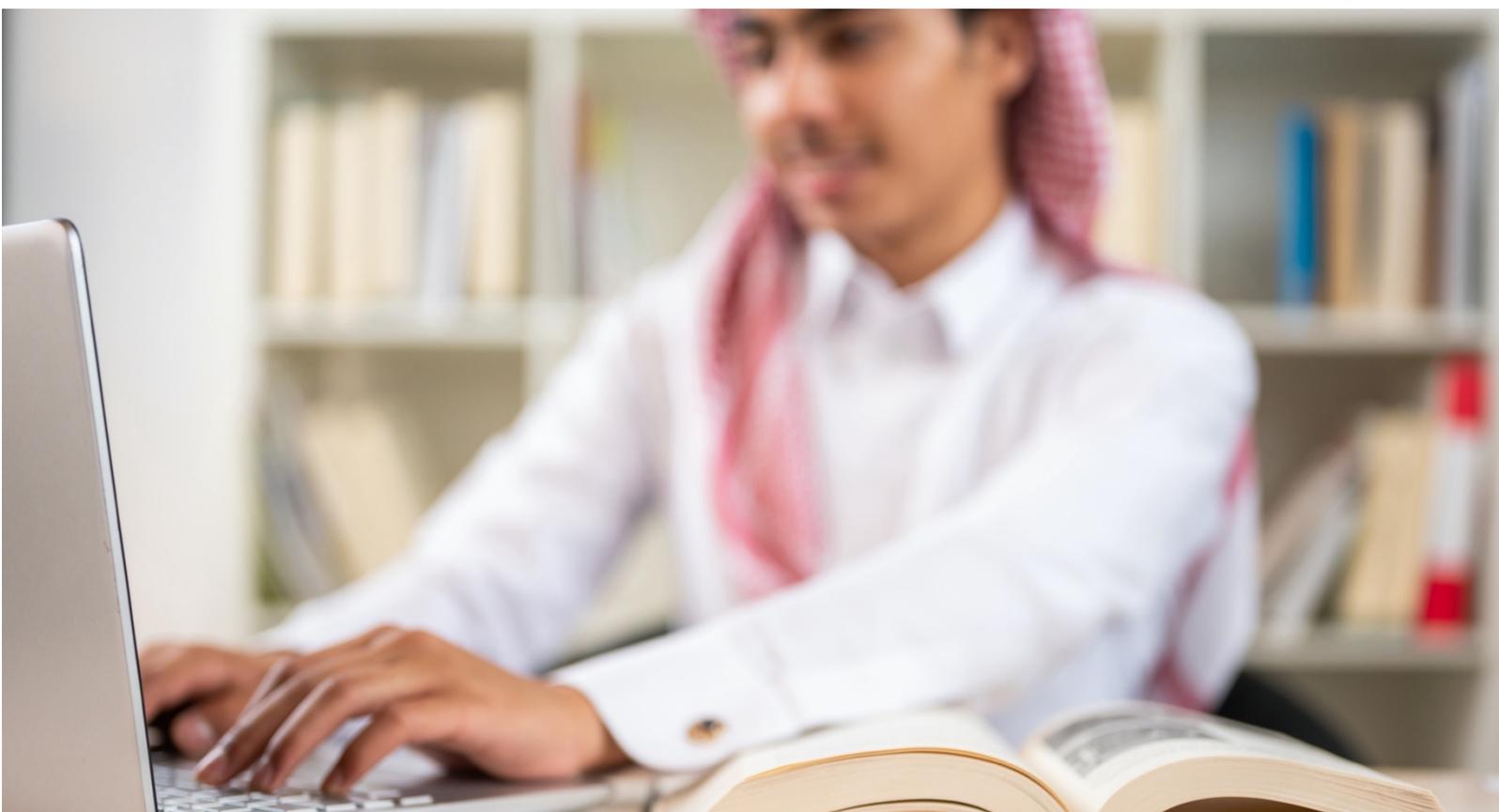
Dr. Bandar Alamer
Deputy Director General for
Partnerships and Investment,
NeLC, KSA

“Assessment through learning analytics is about obtaining descriptive or predictive insights from online education data using data science techniques and having a clear set of educational or business goals in mind. Another trend is immersive learning, which is any kind of training that places the learner in an interactive environment to get an all-around experience of a concept or skill. This experience can be physical or virtual. Such assessments can provide both physical and emotional attributes to the assessment practice. Thus, the suggested assessment trends will lead to a better understanding and efficient user engagement.”

While unfettered, unvetted learning resources are readily available for the most intrinsically motivated individuals, a new era of accredited, official, and curated learning platforms has emerged to provide learners with professional and high-quality alternative learning pathways to gain new skills, knowledge, and educational experiences in non-traditional higher education.

Platforms such as LinkedIn Learning (formerly Lynda.com), Coursera, Udemy, EdX, Khan Academy, and MasterClass represent new educational models for lifelong learners that may not want, need, or have access to traditional degree programs. These platforms have strategically targeted the lifelong learner by providing online access to hundreds of thousands of hours of educational content aimed at developing specific skills and knowledge as needed. Many course and certificate programs offer self-paced competency-based education learning models in which there is no educator but rather a course structure built to support the learner's mastery of a skill or topic without requiring learning "in class" with other learners. Another element of these platforms is the offering of a micro-credential or certificate (even from accredited universities) to provide the user with a tangible outcome or proof of experience for their learning efforts. As such, some critics have started to challenge the historical dominance of degrees earned from traditional education institutions in comparison to micro-credentials earned through lifelong learning platforms. Observing an increased skills gap between graduates and current employees, companies are turning to novel means and emerging training entities to find highly qualified candidates.

If an educational ministry or authority can (or already has) identified areas of desired improvement or upskilling in their workforce, investment in a curated lifelong learning platform or collaboration with existing platforms to provide social and economic incentives to upskill large portions of the workforce may be highly advantageous. An example of this would be offering science, technology, engineering, art, and math education/leadership certificates and micro-credentials to upskill an educational workforce.



Blockchain as a Driver of Innovation for Educational Assessment and Credentialing

As educational opportunities reach more learners through technology-enhanced means, business and accreditation practices should also leverage emerging technology to digitalize the collection and management of learner records. To this end, blockchain technology has been identified as an emerging technological trend that could not only support assessment and verification across educational institutions but also reliably account for a learner's history as they pursue industry and work-life applications (Schroeder, 2020). Andrew Singer (in Schroeder, 2020) has noted that people in a post-COVID-19 world “will need to seize ownership and control of their educational credentials—documents like degrees and transcripts—from schools, universities and governments” (para. 8). As such, blockchain technology may increasingly set a new standard for credential dissemination for learning institutions in the coming years.

Beyond its value for higher education, Cedeno (2020) also notes that blockchain could support innovation in K–12 education through the recording and publishing of completed coursework by serving as a hub and portfolio of a learner's work or even as a transcript that follows them through all levels of education. In this scenario, someone who transferred schools would be able to avoid the hassle of tracking down their records and relying on often costly administrative processes; the blockchain would instead host a transcript securely and on-demand.



Credentials are digitally secure.



Learners can “own” their earned credentials, instantly sharing them when and where they choose.



Digital badges can provide a model starting point for integrating entries into the blockchain.



Details are stored on the ledger by the institution, so entries are more than a course name and number—they can include topics mastered and even examples of work.



Noncredit activities and accomplishments, such as internships, can be certified and stored on a learner's credentials.

Prospective relationships between blockchain and AI technology are also materializing. Roschelle et al. (2020) have suggested that in the near future, “AI-based assessment might produce a robust profile of a learner as a writer across contexts. This could include an ability to anticipate or predict how the learner might perform given particular writing tools, in a subject matter, in a new setting, or within a workplace” (p. 15). In such a scenario, we can imagine the benefits for learners who could more effectively learn to write through processing their ideas verbally first via rich talk-to-text programming. Roschelle et al. (2020) also note how “opportunities to include diagrams, drawings, pictures, and other representations would be expected as part of the writing process” (p. 15). These kinds of technologically enhanced writing environments “might include scaffolds, supports, or prompts—and note the kinds of supports that enabled peak writing outputs. Data could be summarized across many writing experiences in a student’s life, rather than limited to writing as a component of the grade of an individual course” (p. 15).

Looking even further ahead, AI-based assessments a decade in the future may support learners in demonstrating and exercising skills that have previously been difficult to measure or recognize through traditional assessments. As Roschelle et al. (2020) have noted, this could include “a student’s ability to use a simulation to investigate a scientific phenomenon, or their ability to design and engineer a tool to solve a challenge” (p. 15). The development of teamwork, problem-solving, and collaboration skills on a blockchain through AI mediation presents new possibilities for how learners gradually accrue knowledge. As a result, a greater understanding of learner agency and efficacy may emerge from the data generated by these experiences and inform practices such as game-based assessment, offering learners and/or employees the ability to demonstrate what they know through roleplay within relevant contexts, for example, as opposed to filling out a form or responding in other ways that privilege memorization over embodied knowledge.



FUTURE DIRECTIONS & RECOMMENDATIONS

01. Continued expansion of broadband and high-speed internet to facilitate the spread of online learning and the promotion of ubiquitous learning opportunities.



The KSA already has an ambitious ongoing investment in modern digital infrastructure as a component of the articulated strategic planning of Vision 2030 (KSA, n.d.). The World Bank recently noted, “the country continues to strengthen its digital infrastructure by deploying 5G networks and investing in 6,500 new towers, essential for the shorter radio wavelengths to provide effective coverage” (Khoury, 2020, para. 3).

Alex Kaplan, Global Leader, Digital Credentials at IMB, noted the following trends in his survey response: *“Broadscale movement towards competency-based learning that identifies skills as students’ progress through the system. General adoption of trusted digital badges and credentials as an addition to formal diplomas. This will require alignment of learning to skills and competencies and the technical ability to issue digital badges, credentials, and diplomas.”*

This investment in expanding access will support the continued growth of online learning across all levels of education and training, creating new opportunities and possibilities for ubiquitous learning, self-learning, and postformal learning in vocational sectors. Citizens continue to pursue long-life learning, access to on-demand lessons, videos, and rich media content across subject areas, this will allow for both human flourishing and economic growth. Similarly, continued growth toward ubiquitous learning will necessarily be reliant on the infrastructure required to provide all citizens access to all sorts of learning opportunities.

02. Support for expanded online and digital learning opportunities as well as personalized learning pathways and learner autonomy.



Based on the available reports and research on current trends, it is recommended that the KSA continue to pursue online and digital learning opportunities in K-12 and higher education as well as to support long-life learning opportunities through partnerships with the country's private sector. As the need for continuous pathways for learning grows across all sectors of life across the nation, KSA has an opportunity to model what it truly looks like to apply nationwide upskilling and reskilling. As a way to entirely rethink K-12 and higher education, pathways for long-life learning may take people backward and forward through higher education, or perhaps even through apprenticeship and internship opportunities mid-career, late-career, or even through retirement.

Anant Agarwal, Founder, edX and Chief Open Education Officer, writes, *“Online learning will play the single most important role in reskilling and upskilling the workforce in the country. As a current leader in the region and globally, the KSA has already embraced the importance of continuous lifelong learning—the most important step in creating meaningful and impactful change.”*

As Mishra (2020) has noted, the notions of adolescence and retirement are themselves relatively recent creations of the 20th century. That is, the provision of formal education for youth and adolescence, with gradual release into adulthood, is a relatively nascent construct. So, too, is the notion of retirement and senior living, according to which adults in the later stages of life retire into leisure and/or post-career pursuits. As such, with the projection of the further exploration and expansion of personalized learning technologies, including through AI and predictive analytics systems, learners may gain access to unique pathways that are no longer reliant on an outdated grammar of standardization towards an average learner.

Agarwal further writes, *“With the advent of virtual classrooms and personalized learning journeys, the reality of and demand for lifelong learning will only increase. Lifelong, flexible learning pathways will become important for all learners in order for them to stay viable and employable and for the organization they work for, to stay viable and agile enough to deal with the fast pace of technological change. We hope everyone will continue to embrace and understand the importance online learning will have in all aspects of one's life.”*

03. Explore the potential for emerging blockchain technology to provide greater security, transferability and support for knowledge sharing across the country.



As technology continues to develop and disrupt current practices and industries, securing and validating educational credentials and records, as well as the need to secure sensitive data, will continue to grow. To this end, the country may look towards investing in the potential of blockchain technology to offer institutions, organizations, and individuals greater security and protection over their data. The use of blockchain would also allow for more robust demonstrations or portfolios of learning for individuals, which capture robust degree and credit-bearing credentials as well as non-degree-related/non-traditional evidence or records of knowledge, skills, and capabilities.

Professor John Domingue, Director Knowledge Media Institute of The Open

University wrote the following in his survey response: *"I believe that the combination of AI and blockchains will facilitate the automation of many areas of teaching and learning whilst empowering students. My team believe in the concept of 'Self Sovereign Students': students who own, manage, and control all their learning data including their gained accreditation."*

Similarly, Kaplan, Global Leader, Digital Credentials at IMB, suggested the following:

"Assessments focused on skills, competencies, and certifications. Transition of all this to trusted and verified credentials provided to learners in self-sovereign wallets."

As citizens move more nimbly through learning and working spaces, the ability to easily add credentials and demonstrate competencies and certifications that can be verified through distributed ledgers will offer increased mobility and capacity to innovate at speed.

04. Increased investment in digital and online educational content, media, and technology platforms.

The nature and location of learners' engagement with educational content and media continues to trend toward mobile and interactive experiences. Expanding opportunities to provide learners with learning through AR, VR, XR, and other immersive simulations or game-based experiences will create more enriching and authentic learning. These learning experiences will also establish a citizenry more capable of creating and sharing their own content and offerings based on their lived experiences and insight into problems of practice.

Another recommendation in this area is to dedicate resources and strategic planning to building out robust and continually growing content libraries for learners to engage with on an anytime, anywhere basis. As learners continue to learn both around the clock and across their lifespans, having accessible high-quality digital learning materials at the ready will be critically important for all learning institutions, ministries, and nations.

In his survey response, Agarwal, Founder, edX and Chief Open Education Officer, writes, *"I think we will see some serious enhancements to traditional online courses. As AI becomes more widely deployed, we will have better access to content in all languages, which will have tremendous upside for the KSA market, as it will increase the amount of content offered in Arabic. The need to rapidly re-skill learners will become more urgent, and companies will turn to micro credentials, like MicroMasters® programs and short course offerings to help fill a labor market that is in demand of workers with new, relevant skill sets."*

05. Continued professional learning support emphasizing deeper learning, digital learning, and learner agency/ownership of learning.

As institutions continue adopting technological advancements, they must prioritize support for the educational workforce and delivering meaningful, human-centered learning experiences to those in their charge. To that end, it is recommended that professional learning that reimagines learner autonomy and agency—including project-based and authentic learning experiences buoyed by both formative and summative assessments and feedback—become a primary focus. Educators will also need extensive technology training and support as they pursue their own learning and explore how to promote deeper learning for both their learners and them. It may also be worth considering how the roles of educators will shift and integrate into larger sectors of the economy as well as how formal schooling institutions and educator roles might be useful within industries as organizations and corporations recognize the need to continually upskill and train their workforces.

Dominque, Director Knowledge Media Institute of the Open University notes the importance of professional development for educators in advancing online learning in a survey response, writing about the need for a “dramatic increase in capacity and capability of educators to deal with state-of-the-art technology. At the moment many educational institutions (and staff) are tied to the print era.”

CONCLUSION

The future of learning in the KSA is digital and success depends on the navigation of volatile, uncertain, complex, and ambiguous global contexts. However, as the world continues to recover from the COVID-19 pandemic, new opportunities to interrogate and critique the present moment create rich possibilities for future learning experiences across citizens' entire lifetimes. As new technologies such as AI and XR continue to create uniquely engaging experiences and pathways for individual learners, learning opportunities will increasingly address the various needs of individual learners anytime and anywhere.

The recommendations from this report include continued expansion of broadband and high-speed internet; support for personalized learning pathways and learner autonomy; an exploration of the potential for emerging blockchain technology to provide greater security, transferability, and support for knowledge sharing; increased investment in digital and online educational content, media, and technology platforms; and continued professional learning support emphasizing deeper learner-led learning, particularly in digital spaces. The successful exploration and implementation of educational methods in accordance with these trends will rely on a continued emphasis on data privacy and security as well as on the provision of social-emotional support for young learners.

As with any organization, schools are subject to redesign. Based on the KSA's robust vision to expand opportunity and innovation as a global leader, as outlined in its Vision 2030 agenda, it is wholly appropriate that the education sector within the country also engage in a moment of reflection and reimagination regarding what might be possible. As the crisis-within-a-crisis of COVID-19 fades, the opportunity to pursue further innovation within the education sector shines ever brighter.



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