



THE LEARNER'S JOURNEY

4 Learning-Space Scenarios That Reflect 13 Dynamic Trends Impacting the Future of Education

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INTRODUCTION

Higher education is in the midst of unprecedented change and faces pressure to transform broadly and rapidly. Unfavorable economics, new competition, and reduced career opportunities for many new graduates are translating into declining value propositions for stakeholders.

Taken together these factors are truly disruptive for business-as-usual approaches to higher education. They call for fundamentally different strategies, business models, and emerging practices to deal with the Age of Disruption that will extend to 2020 and beyond. More specifically: what must change in teaching and learning environments?

We are simultaneously witnessing dramatic and fascinating trends from outside our industry. These will change the classrooms of today into something few of us dreamed of just a generation ago. Other trends emerging from within education will additionally transform our institutions. These changes will require significant revisions to how faculty teach and mentor, how students learn, planners plan, and facilities transform. These forces will also reshape how the many companies that partner with institutions reinvent their practices to prepare, support, and interact with those on campuses.

This paper identifies 13 of the biggest trends impacting higher education and uses them to develop four key learning scenarios—depictions of what may emerge in the not-too-distant future. Each scenario blends a few of the trends together into distinctive futures. These scenarios are not mutually exclusive; all can exist at the same time, in different places, and to varying degrees. The focus here is simply to address the competing and complementing futures of

what may begin to appear in higher-education teaching and learning spaces, both the physical and the virtual. The result is valuable insights into what's needed now and concepts for preparing for an inevitable future.

SCENARIOS FROM THE FUTURE

The following four scenarios are not predictions, but rather colorful illustrations of what might result when various emerging trends intersect. Each scenario takes three to five trends, then extrapolates and mixes them together. The resulting focus is on elements that could begin to appear in higher education teaching and learning spaces (physical, virtual and blended).

The scenarios offered here are much different from the standard “classrooms of the future” exercises we’ve all read. Instead, these four scenarios pose “what if” visions that can help organizations take actions now (if this was so, then we should do this...now). And it provides insights into how to deal with different variations on the themes—all occurring at the same time, in different measures, in different institutions and learning enterprises.

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Maker Co-Learning Spaces

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SCENARIO FOUR:

Free-Range Learning

“Emerging trends will require significant revisions to how faculty teach and mentor, how students learn, planners plan, and facilities transform.”

13

DYNAMIC TRENDS

MAKER MOVEMENT

SOCIAL AND PEER LEARNING

DESIGN THINKING

ENTREPRENEURSHIP

PERSONALIZED LEARNING

COLLABORATIVE PROJECT-BASED LEARNING

BLENDED LEARNING

VIRTUAL WORLDS

REAL-WORLD SIMULATIONS

INTERNET OF THINGS

GAMIFICATION

3D PRINTING

COMPETENCE MARKETPLACES

“Students are working with their hands, creating models of potential solutions, iterating prototypes, testing outcomes ... and sharing a stake in their learning.”

INTERSECTING TRENDS

Illustrated in Scenario One

MAKER MOVEMENT

A current cultural movement based on DIY (do-it-yourself) experiences and creative expression. The movement focuses on learning and doing, plus developing skills to manipulate objects and environments.

SOCIAL AND PEER LEARNING

Theory that acknowledges learning as a cognitive process that takes place in a social context, further developed into a method whereby learners develop skills along with other fellow learners without any implied authority to any individual.

DESIGN THINKING

Problem-based in nature, the approach provides tools for creating choices through ideation, employs other tools for making choices through convergence, and finally iterates prototypes of possible solutions through to the implementation of ideas.

ENTREPRENEURSHIP

A mindset and process of taking ideas to viability and commercialization and starting a business, company, or other form of organization to support it.

I SCENARIO ONE: MAKER CO-LEARNING SPACES

The maker movement has shown us that unleashed creativity can have surprising results both in terms of what is produced and in the experiences that “makers” have along the way. Serious learning happens both at the individual level and in the groups that come together, whether in person or through social media use.

Related to the maker movement is the design-thinking perspective—especially the aspect of prototyping. When we mix together the entrepreneurial spirit with the trends in peer learning, the maker movement, and design thinking, we observe a potential wondrous future for applications to higher education learning.

We see early signs of these trends moving into higher education where a few faculty and programs are already translating this energy to the classroom. We know that certain academic disciplines are further along in modifying courses, program curricula, and physical spaces. Examples include the Rotman Business School at the University of Toronto, and the Plattner Institute of Design at Stanford.

SCENARIO ONE: LEARNING SPACE PROFILE

Here we find the lecture hall long gone, replaced by flexible spaces that can accommodate materials relevant to problems that groups of students are working on. Regardless of the nature of the problem, students are working with their hands, creating models of potential solutions, iterating prototypes, testing outcomes with actual users of the solutions, and all sharing a stake in their learning. The role of



the faculty member has moved well past that of a vehicle for content, past that of a mentor, to one of a co-learner and guide throughout the process of learning by design. Learning feels more like play than work, but play with a purpose.

A keen focus of this scenario will be on faculty development needs. By addressing their development, the industry will empower and enable the transition from the teachers of 2015 to those that will lead learning by design in 2025.

Such design-oriented, maker co-learning spaces are constructed and filled to maximize creativity, interaction, and problem solving. Entries are wide and flexible to allow for materials to easily flow in and out. Walls serve several purposes; less to define one room from another, and more to create workspaces for objects and visualizations, as well as create sound barriers when bleed-over between learning engagements is not wanted (sometimes it will be!). Such walls also serve as carriers for technologies.

Learning takes place equally in sitting and standing positions as well as in motion—walking, interacting with objects, and moving from group to group. It is more important that sitting space be portable than comfortable (some design spaces actually use uncomfortable seating on purpose). Information devices will be in demand not only to project information but also to capture ideas and quickly depict them, collect them, and store them for reworking later.

Surprisingly, and contrary to what many technology firms have tried to tell us, analog will be more important than digital for many learning experiences and spaces. Simple technologies like sticky notes, markers, small manipulables, and creative objects will be critical to pushing creativity. The focus is on underbuilt environments rather than overbuilt ones that can get in the way of learning. Storage and quick access to a wide variety of materials will also be necessary.





SCENARIO ONE: STUDENT PROFILE

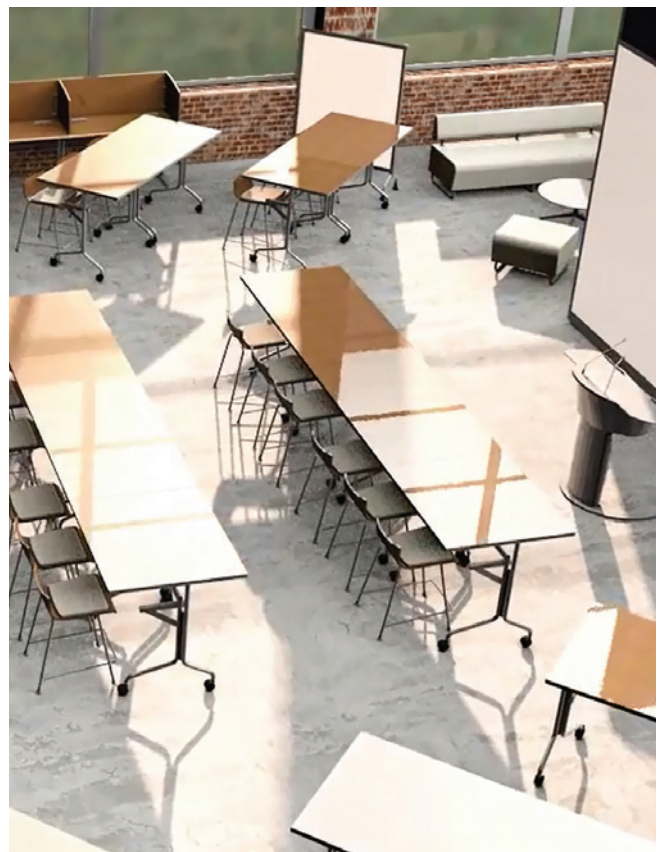
Jeannette Davies is a third-year undergraduate student at Michigan State University majoring in an interdisciplinary degree program in design thinking and urban design. From the start of her enrollment at MSU, she has used maker

co-learning spaces as the fundamental venue for her design courses and for co-curricular experiences in design competition and problem-solving experiences.

Her typical academic schedule has included extended blocks of time spent at these facilities, with just-in-time (JIT) blended learning experiences to provide insights needed to solve problems related to the projects. Access to most of



Design Center – as workshop



Design Center – as lecture space

“Design-oriented, maker co-learning spaces are constructed and filled to maximize creativity, interaction, and problem solving.”

these spaces is available on a 24x7 basis as well. Jeannette's learning life is like an extended, group-oriented design and problem-solving session, punctuated by pivots to change direction and modify prototypes, and informed by JIT learning, research and problem solving.

Jeannette also has engaged in other formal, blended learning experiences that did not involve maker co-creation spaces.

In order to develop baseline knowledge in design thinking and urban design, Jeannette engaged in and mastered a personalized learning of a body of knowledge.

Watch the video on
Maker Co-Learning



Design Center – as meeting place



INTERSECTING TRENDS

Illustrated in Scenario Two

PERSONALIZED LEARNING

Includes a large, customizable array of individualized pathways to skill and degree attainment. Some involve large classes, some involve online content acquisition, some involve peer learning in small groups, and some involve few of these or any recognizable classroom experience.

COLLABORATIVE, PROJECT-BASED LEARNING

A learner-centric approach to learning that goes beyond the traditional method of testing students as they amass content knowledge. The basic assumption is that learning is much more than knowing; it involves doing, applying, and reflecting on one's own actions.

BLENDED LEARNING

Often called hybrid learning, it occurs when traditional classroom learning is combined with varying types of online learning experiences, including extensive use of social media.

2

SCENARIO TWO: BOUNDARYLESS LEARNING SPACES

Some have suggested that the advent of the Internet, learning management systems, and online content have signaled the end of brick-and-mortar learning experiences. While the borders of the classroom have surely expanded, there remains a need for spaces dedicated to learning. Learning spaces will become optimized as interactive environments and project spaces.

Three trends are intersecting to accelerate this phenomenon. The first is blended learning. It's a concept widely talked about in higher-education circles, but infrequently practiced very well. Leading institutions have discovered the vision of collaborative, active learning spaces and blended experiences, but most examples are first generation and will evolve substantially over the next few years.

Beyond online discussion groups and the flipped classroom, truly blended learning takes the position that "content is free," and extends this to the point that there is little value for the learner to be spoon-fed content. In fact, the learner will become the very center of the experience. Rather than passing through a series of obstacles and jumping through hoops to receive credits, personalized learning will customize the experience to an extremely high degree. It will all be brought together in project-based learning, with students moving in and out of group projects based on how they see their total learning experience evolving.

“The learner will become the very center of the experience.”

SCENARIO TWO: LEARNING SPACE PROFILE

Sound like a free for all? It's not. That's where the role of the school, program, and faculty members come in. Programs will need to curate content, construct learning experiences, and mash-up open-source resources and experiences into next-generation learning experiences. Schools will need to certify programs and measure student learning and outcomes to ensure they can prove quality in the programs.

Faculty will need to drive it all, being experts not only in one tiny sliver of content in the universe, but in how universal content can be integrated to solve a set of wicked problems relevant to the program.

The role of the learning management systems of today and their next-generation replacements will be augmented and heightened. Like the credit hour of the 20th century, digital platforms will be the entity that connects student experiences, relevant content, faculty effort, and managed certification and degree granting. Project-based learning will also create the need for students to engage in a wide variety of locations, across disciplines, outside of traditional learning hours, and frequently off campuses entirely.



“Project-based learning will create the need for students to engage in a wide variety of locations, across disciplines, outside of traditional learning hours, and frequently off campuses entirely.”

In this future, the educational home base is the online learning environment for most participants in the learning experience – students, faculty, and support staff. Classroom buildings will have a variety of learning spaces, few of which are the same, but many of them will be more like consultative spaces than classrooms with seats bolted to the floor all facing a pulpit.

Gone, too, are the computer labs so sought after and prevalent in the year 2000. The handheld and wireless revolutions took care of that.

Personalized and competency based learning has unseated traditional classes, tests, cohorts, and curricular pathways. Beyond the flipped classroom, students and faculty help to evolve the variety of a building's learning spaces over time by understanding evolving needs, usage data, and quickly adaptable configurations.





We see two simultaneously evolving learning spaces – interactive space and project space. Interactive spaces are places where people come together to talk, share, and exchange ideas. It's where faculty can meet with students one-on-one or in small groups. It's where students can come together in purposeful dialog and discourse. It's both disciplinary and interdisciplinary.

Project spaces are places where work gets done, as expected in student and faculty departments and programs. But work also gets done out in companies, agencies, and organizations that sponsor learning and through the hosting of external projects on campuses.

SCENARIO TWO: STUDENT PROFILE

Paul Lebraun is a second-year student in psychology at Indiana University. He was attracted to IU by many factors. That includes the institution's massive commitment to personalized learning, enabled at scale by IU's next-generation digital learning environment. The loosely coupled elements of these environments have enabled IU to create personalized learning, at scale, across the entire curriculum, and incorporate learning apps seamlessly across the infrastructure. Paul was able to engage all of his learning materials through his smartphone.

Paul's personalized experience began as a freshman, when all of his courses were personalized, consisting of one, face-to-face meeting per week in an active learning environment. Throughout the week, he engaged his learning online on a 24x7 basis, engaging other learners at similar stages in their learning progress. His physical "classrooms" had been retrofitted for active, collaborative learning, with flexible furniture, collaborative technologies, and flat-panel screens and relaying ICLT of many kinds. Informal, collaborative, and learning spaces are strewn across academic and non-academic spaces on- and off-campus. In essence, every space is a learning space.

Paul has also participated in the entrepreneurship club and is working in the behavioral science research labs 15 hours a week on an undergraduate research project for which he qualified based on his deep dive into advanced material in his personalized learning course in psychology.

Watch the video on
Boundary-Less Learning



“Students will need both physical proximity as well as virtual engagement to immerse in the simulations and interact and debrief about their learning experiences face-to-face.”

INTERSECTING TRENDS

Illustrated in Scenario Three

VIRTUAL WORLDS

Computer-based simulated environments inhabited by users as avatars with a varying degree of reality versus fantasy.

REAL-WORLD SIMULATIONS

To create or imitate actual events or situations in a safe environment to stimulate innovation, learning and problem solving. Simulations bring together multiple perspectives and disciplines in order to best account for the large number of variables at play in the real world.

THE INTERNET OF THINGS

Physical objects, including humans, are embedded with small sensors, software, electronics, IP addresses — all connected via a cloud-based infrastructure that allows for interactivity and control by the user and other connected devices.

GAMIFICATION

Adding elements of game play to a non-game activity.

3D PRINTING

Employs mechanical processes to produce three-dimensional objects, primarily through computerized, additive processes through which successive layers of material are laid down under computer control.

3

SCENARIO THREE: IMMERSIVE VIRTUAL SIMULATION LEARNING

The statistics on gaming are staggering. Billions of hours are spent each year in games and virtual worlds, and within those worlds a great variety of activities are occurring, many of them with learning components.

As technology continues to get smaller, and gain power, fidelity, and pervasiveness, the boundaries between what we think is real and what is virtual are blurring past recognition. And it's all coming to our learning environments. We already see virtual learning at work in the military and corporate world with training and preparation programs. Outside of a few schools and several programs in certain disciplines, most of higher education is well behind.

Simulations allow for intentionality in immersive, virtual learning. Smart objects with sensors and location devices allow real objects to be easily tracked and rendered in virtual spaces. Affordable and fast 3D printers allow virtual objects to be rendered in the real world, adding to the seamlessness of the transitions between virtual and real. As these trends intersect, the concept of learning, classrooms, and buildings, and even degrees and programs will be sharply redefined.

More than any other scenario, immersive virtual simulation learning puts stress on current higher education's infrastructure and faculty preparation to help deliver content and experiences. It is the students who will be the most comfortable with this type of engagement and experience.



SCENARIO THREE: LEARNING SPACE PROFILE

Contrary to the public image of the gamer alone in his dark bedroom, immersive virtual simulation learning is a highly social activity. Students will need both physical proximity as well as virtual engagement to immerse in the simulations and interact and debrief about their learning experiences face-to-face.

Learning spaces will need to transform in significant ways. Technology will be ubiquitous and unobtrusive. These open and modifiable spaces and rooms allow for a seamless blending of virtual objects, real work objects, computer models, and human movement and interaction.

Watch the video on
Immersive Learning



SCENARIO THREE: STUDENT PROFILE

Ghazala Komal is a third-year student in biochemistry and business administration at Virginia Tech. She was attracted by the institution's commitment to embedded technology, virtual reality-enabled spaces, and an interdisciplinary approach to innovation, entrepreneurship and problem solving. She aspires to a career in medical innovation and commercialization.

From the start, Ghazala selected course options that incorporated substantial simulation and visualization techniques. She has been working with a professor on translating biochemistry data into the "data room" where results can be experienced physically and visually.

In her business administration courses she has selected options that involve a high degree of gamification and team-based problem-solving competitions. Ghazala's biochemistry courses have heavily involved laboratory work and research opportunities with faculty and other undergraduate and graduate students.





INTERSECTING TRENDS

Illustrated in Scenario Four

PERSONALIZED LEARNING

Includes a large, customizable array of individualized pathways to skill and degree attainment. Some involve large classes, some involve online content acquisition, some involve peer learning in small groups, and some involve few of these or any recognizable classroom experience.

SOCIAL AND PEER LEARNING

Theory that acknowledges learning as a cognitive process that takes place in a social context, further developed into a method whereby learners develop skills along with other fellow learners without any implied authority to any individual.

COMPETENCE MARKETPLACES

A meta-trend composed of three interconnected developments, are an ecosystem for perpetual learning, recognition of demonstrated competences, and matching of competences with employment needs.

4

SCENARIO FOUR: FREE-RANGE LEARNING

Individuals will acquire and refresh particular competencies throughout their lives as learners, workers, and citizens. Even students enrolled in residential degree programs will augment their curricular experiences with co-curricular and work experiences, and with DIY learning.

As such, students will expect institutions to be flexible in encouraging and accommodating such behavior in the future. This ecosystem will dramatically affect the learning and competence building that occurs in association with institutions, employers, and individuals acting as “free-range” learners. Colleges and universities will be part of this learning, competence, and employment ecosystem. As it evolves, it will influence the choices, pathways, and knowledge-gap decisions of many learners. It all adds up to future behavioral patterns that will likely be very different from today’s patterns.

Moving far away from today’s captive audience of uninformed undergraduates, learners will be very savvy about ways to combine experiences to create highly customized credentials. The marketplace will also drive students toward integrated working and learning lifestyles. Coupled with the cost trajectory for education, more and more students will be less than full-time students.

Existing learning providers are granularizing their offerings to fill knowledge gaps and certify competences, while new cloud-based-providers are ramping up to provide these services. Institutions and their faculty will need to think of ways to attract learners not only to institutional brands, programs, and departments, but to individual learning experiences.

“Learners will be very savvy about ways to combine experiences to create highly customized credentials. The marketplace will also drive students toward integrated working and learning lifestyles.”

SCENARIO FOUR: LEARNING SPACE PROFILE

The impact on the classroom and learning spaces will be uneven and quite dramatic for some schools and programs. The classroom of today will have a place for star faculty and highly regarded programs that may choose to continue to offer traditional learning pathways.

For most programs, however, the learning spaces they provide will need to be a featured part of how courses, programs, and more granular experiences are marketed in a highly competitive environment. Institutions will also need to expand learning spaces off traditional campus settings, especially in urban areas. They should consider partnering with employers and other large organizations that are naturally rich with experiences that can be coupled with learning to generate additional venues for free-range learners.

SCENARIO FOUR: STUDENT PROFILE

Jianping Chang is a graduating senior in engineering systems and design at University of Wisconsin Madison. Before enrolling three years ago, she participated in concurrent enrollment and received sophomore standing as an entering student, although she intended to graduate in four years. Her acceleration was achieved by augmenting her competences with a purposeful collection of personal learning, competence building, and work experiences.

While enrolled at University of Wisconsin she augmented her course of curricular study with active co-curricular participation in leadership development, entrepreneurship,

design competitions, and problem-solving competitions. She also participated in employment and problem-solving engagements that built a track record. In each of these instances, she received competence assessments that were recorded in a personalized transcript available through a Knowledge-as-a-Service (KaaS) utility called “Make It So,” the contents of which were owned by Jianping.

Throughout her formal curriculum, Jianping selectively extended her course-based competences through Make It So, which certified the competences demonstrated; these became part of her transcript as well.

She joined LinkedIn in her second year and used the competence marketplace to identify the kinds of competences she would need to meet the requirements of current job postings. This consciously filled gaps between her attainment and the marketplace’s demands. In her final year, she focused on employment experiences, and in filling the remaining or new competence gaps revealed by her mapping. Some of these gaps were filled by formal UW-certified courses or independent studies; others by Make It So; and still others by other online providers.

By the time she graduated, she had substantially extended the competences she would have achieved by simply following the prescribed undergraduate curriculum.

“There are other emerging disciplines that will be required for the jobs of the future that don’t yet exist today. Therefore, most institutions will need to explore how to best blend spaces to meet their individual needs.”

CONCLUSION

There are three additional observations we have made about the above scenarios. First, not every scenario will be the best for every discipline. There are certain modalities of learning that are naturally better suited for certain disciplines than others.

For example, the social sciences and the hard sciences differ in their research techniques, specialized instrumentation, and practice in the requisite skills and competencies. The art and science of dentistry requires clinical experience and hands-on training with patients. There are other emerging disciplines that will be required for the jobs of the future that don't yet exist today. Therefore, most institutions will need to explore how to best blend spaces to meet their individual needs.

Second, taking ideas to action and execution can be challenging. The visions created in the scenarios will take work to make them so. Also, new trends are likely to emerge. Therefore, continued vigilance and exploration must accompany implementation. We recommend an expeditionary approach to any strategic implementation during times of rapid change and disruption. Expeditions have starting points and a future state you are trying to reach. There may be many way stations or particular future

states along the way. It's best to move along the expected path and continue to monitor your course and conditions, making corrections along the way as the environment changes. Finally, even with pitch-perfect execution, new ideas and technologies have a natural rate of adoption. The idea, first developed by the Gartner Group, is that adoption of new approaches, new technologies, and other innovations, follow a consistent, predictable pattern.

First there is a trigger – an idea emerges from science fiction, R&D, or other industries. Models are built and early adopters test it out. People get excited and expectations are created perhaps beyond the original design or intent. But when inflated expectations are not met, disillusionment sets in. The innovation continues to evolve and second- and third-generation products yield improvement. People use them better. Finally, high adoption sets in and a viable product suited to its environment and understood by its users is firmly planted.

We see this pattern time and again in educational applications. We expect to see it play out in the high times of innovation that are ahead for learning spaces. For now, it's off to the future.



APPENDIX

13 Dynamic Trends Impacting the Future of Teaching

1. The Maker Movement is a current cultural movement based on DIY (do-it-yourself) experiences and creative expression. The movement focuses on learning and doing, plus developing skills to manipulate objects and environments. Design thinking permeates this movement and 3D printing is a hot, related trend (more on these later). Perhaps the epicenters of the movement are the Maker Faires around the country and around the world. From its website, a "Maker Faire is an all-ages gathering of tech enthusiasts, crafters, educators, tinkerers, hobbyists, engineers, science clubs, authors, artists, students, and commercial exhibitors. All of these 'makers' come to Maker Faire to show what they have made and to share what they have learned."

These fairs created an ecosystem of related events, products, and services and they have heavyweight sponsors and devoted fans and participants. One interesting site is <https://www.inventables.com/>. *Make* magazine was launched in 2005 and serves as a flagship publication for the movement. Another close relative to the movement is Kickstarter, perhaps the largest online funding platform for creative projects. Nearly \$2 billion has flowed through this platform.

2. Real-World Simulations create or imitate actual events or situations in a safe environment to stimulate innovation, learning and problem solving. They extend the learning of skills and competencies to actual problems and solutions in safer, lower risk, and less costly environments. Simulations bring together multiple perspectives and disciplines in order to best account for the large number of variables at play in the real world. They contribute both to the development of theory and to practical applications and prototypes (more on this trend Design Thinking below). A handful of universities are offering entire programs in simulation.

As the power of related technologies increases and costs go down, real-world simulations are increasingly being used. How real can a simulation be? Commenting on this trend, some philosophers and futurists have postulated that our current reality is actually a simulation. Others suggest that the artificial intelligence that creates simulations will eventually merge with human intelligence in a singularity. We're not sure, but for now, we can explore how simulations can advance learning and understanding our world.

3. Collaborative Project-Based Learning is a learner-centric approach to learning that goes beyond the traditional method of testing students as they amass content knowledge. There is a basic assumption at play that learning is much more than knowing. It involves doing, applying, and reflecting on one's own actions and impacts as an agent in the world.

Using this active learning method, learners develop skills by working over time to investigate and respond to complex questions, problems, or challenges. Learners work in teams rather than on their own.

Problem-based learning, also known as PBL, has been around for some time. However, the current trend is that rather than PBL being an occasional and episodic experience in a student's degree program, entire learning experiences will be designed around PBL with traditional components greatly reduced or eliminated entirely. Faculty shifts from content delivery mode to become problem designers, coaches, and facilitators of process. Students seek out or generate their own content and engage in problem solving, solution testing, advocate for their solutions, and in some cases, act as entrepreneurs. Significant emphasis is placed on the learning environment since PBL requires active learning, learning by doing, and a high degree of interaction.

4. Virtual Worlds are computer-based simulated environments inhabited by users as avatars with a varying degree of reality versus fantasy. They first started to appear quite a long time ago in text-based, role-playing games when the first home computers existed. In recent years the leaps in computing, graphics, and connectivity speeds and power have opened up the possibilities for larger and more realistic worlds.

Today, virtual worlds like SecondLife, Habbo, Minecraft, and others collectively have over a billion users with demographics from young to old; most users are in the 15-25 age range. Worlds exist in multiple sectors including sports, role-playing games (RPGs), gaming, social/open worlds, content creation, more serious scientific-industrial-military pursuits, and education. Experiments in educational worlds have had mixed results, but as the user group ages and the worlds mature, we expect to see a resurgence of applications. There is an emerging market in hardware to support and expand virtual worlds. Oculus Rift is a headset and control device used to interact with VR. It is rumored that Apple and Google are investing significant resources in virtual and augmented reality hardware.

5. The Internet of Things (IoT) finds physical objects, including humans, embedded with small sensors, software, electronics, IP addresses – all connected via a cloud-based infrastructure that allows for interactivity and control by the user and other connected devices. According to Gartner, we will move from about 5 billion connected devices to well over 25 billion in a short time, perhaps the next 3-5 years. This will be leveraged and applied via applications that allow for any number of dreamed, and yet undreamed, possibilities.

We see several forces propelling this forward now: advances in robotics, falling costs of hardware, machine-to-machine communication, potent cloud connectivity, and especially the opportunity for economic benefit. As objects gain intelligence through connectivity and embedded data analytics, entire new markets will open up for new products, new services, and new ways to control and interact with our environments. We are all, for example, awaiting the driverless car, but maybe not the jetpacks we were promised in the 1970s. This single trend may be the most significant in reshaping learning and education – think of the mobile revolution applied to just about everything!

6. Social and Peer Learning is an old idea, now rediscovered and elevated in importance. Social learning theory was first developed by Albert Bandura in the 1960s. Acknowledging that learning is a cognitive process that takes place in a social context, the theory developed into a method whereby learners develop skills along with other fellow learners without any implied authority to any individual. Research has shown that adults learn best in active peer situations.

APPENDIX: The Learner's Journey: 4 Learning-Space Scenarios That Reflect 13 Dynamic Trends Impacting the Future of Education

So what is this trend doing in a list of future trends? It's all due to the pervasive use of handheld devices and social media, putting social and peer learning back into the forefront. Today's students think fundamentally differently than all previous generations. In fact, their brains are changing because of the interaction of technology and physiology. You can get a quick understanding of this if you are older than 25. Think about how many telephone numbers you could remember as a kid versus how many you can recall now. Technology is changing the ways our brains function.

The new trend is that social and peer learning now has a third wheel—our connectivity in the cloud. Combined with mobility and smartphone apps, it's going to reshape education and human development quickly and for years to come.

7. Gamification is to add elements of game play to a non-game activity. There are a wide variety of mechanisms available to gamify something, but common ones include points (awarded to measure achievement in relation to others), badges (visual representations of attainments or achievements), levels (increasing difficulty in tasks and achievements that build as experience is gained), leaderboards (organizing participants into lists ranked by points), and challenges (specific tasks to be completed that encourage engagement and interaction).

Gamification works because of the human psychological propensities for motivation and engagement. Engagement can be driven through accelerated feedback, clear goals and rules, and achievable tasks. We have seen education gamified for some time now, but an expanding trend is emerging as education changes and shifts due to the presence of other trends like personalized competency based learning (more on that trend follows), virtual worlds, and social media. Gamified learning experiences are intentionally designed with specific outcomes in mind. We expect that combining gamification with other trends discussed here like virtual worlds, problem-based learning, and simulations will produce very interesting applications in the coming years.

8. Blended Learning, often called hybrid learning, occurs when traditional classroom learning is combined with varying types of online learning experiences, including extensive use of social media. A number of learning technologies or platforms have been marketed as transformative, and schools have spent a great deal of money on ideas that never substantially impacted learning outcomes (MOOCs, the rise and fall of many for-profit schools, early LMS designs, etc.).

We are approaching the right time for successful applications of blended learning to expand dramatically on the way to becoming the de facto standard. Four accepted types of blended learning have emerged: rotation (students rotate on a fixed schedule between traditional and online); flex (most content and instruction is online and students select traditional sources as needs arise within each course); self-blend (student select between traditional and online modalities across many courses in a program); and virtual (where students have access to both online and traditional modalities simultaneously and can switch between the two to meet their own needs (Staker and Horn, 2012).

In the near future, virtually all learning experiences associated with campus-based learners will be blended to some extent.

9. Entrepreneurship is gaining greater traction; the venture capital and entrepreneurial world is hot right now. Entrepreneurship is a mindset, a process of taking ideas to viability and commercialization and starting a business, company, or other form of organization to support it. Profit may or may not be the driving motivation for doing this. Many enterprises are founded on altruistic, humanitarian, or nonprofit bases and social entrepreneurship is growing by leaps and bounds.

Those at the Entrepreneurship Learning Initiative believe entrepreneurship can be the new core curriculum for post-secondary education. Courses and academic programs are beginning to include entrepreneurial activities to supplement traditional instruction. Many graduate and MBA programs are built around creating entrepreneurs, especially in engineering and business. Institutions are creating academic units and institutes to specifically promote entrepreneurship.


Some cross-disciplinary units, like the Institute for Creativity, Arts and Technology (iCAT) at Virginia Tech, are seeking to blend design thinking and entrepreneurship that draws participants from engineering, business, the sciences and performing arts. Equally significant, entrepreneurship clubs, design competitions, and co-curricular activities are burgeoning at the K-12 level and at many community colleges and research universities – and especially at Land Grant Universities.

Co-curricular activities like entrepreneurship and related work and real-world experience will become increasingly important to the learner's portfolio of experiences. The interconnecting elements of entrepreneurship are pervasive and emerging in multiple ways now in higher education. There is a growing body of literature to support the substantial impact of this trend; we believe that this trend continues to grow and manifest itself in many ways, the full extent of which are yet to be determined.

10. 3D Printing employs mechanical processes to produce three-dimensional objects, primarily through computerized, additive processes through which successive layers of material are laid down under computer control. The cost of 3D printing has gone from prohibitive to affordable in a short time and is expected to shrink even more. A wide variety of 3D printers are available, but the simplest description is that they use inkjet style printer heads to deposit different kinds of materials rather than ink. These materials can combine and harden to form an endless stream of customized objects.

The range and nature of applications make this trend fascinating. Example applications include medical models and body parts, intact working machines like clocks and guitars, food, clothing, and even entire houses. 3D printing is also hitting the consumer market with prices as low as \$1,000 as home applications are only beginning to emerge.

The range of scale and size of 3D printing is also intriguing with printers that can build objects over 100 feet in length, to those that operate at the nano-scale. While there are now 3D printers in lots of institutions' labs, we expect that the education applications will expand rapidly. And, when combined with other trends, it will begin to transform the learning environment that will be experienced by future learners.



11. Personalized Learning includes a large, customizable array of individualized pathways to skill and degree attainment. Some of these involve large classes, some involve online content acquisition, some involve peer learning in small groups, and some involve few of these or any recognizable classroom experience. The age of hyper-personalization in learning is about to become more fully realized. There are many ways to personalize learning, but each of them puts the learner at the center and in control of the experience.

What we expect to see in the next decade are three forces leading to increased personalization:

- Increasing disaggregation of higher education offerings to better serve the individual learner (this includes both disaggregation of content and experiences into more granular knowledge nuggets and the flexibility to achieve credit for prior or concurrent learning or learning from other sources)
- Enhanced use of technology (note some of the previous trends we've discussed)
- Competence-based learning. Competence based learning is an extension of personalized learning that focuses on the granular skill development of the individual learner rather than on them passing a collection of experiences and assuming that learning has occurred. This trend will combine with others to form a meta-trend: competence marketplaces.

12. Competence Marketplaces is a meta-trend composed of three interconnected developments: an ecosystem for perpetual learning, recognition of demonstrated competences, and matching competences with employment needs. Connected learning is the linking and recognition of learning and competence building from many sources, strongly tied to employment and life accomplishment. It includes seamless articulation between learning experiences, and recognition of previous learning and competence building by institutions and certifying agencies.

We see future online providers and services providing individuals with the facilitated ability to individually fill knowledge gaps throughout their lives as learners, workers, and citizens and to present these competences to employers in personally managed transcripts. These services may also provide personal productivity tools and analytics that individuals can integrate into their personal and professional lives and use to perform their jobs more effectively.

Competence Marketplaces will emerge as competence-based learning penetrates the learning marketplace. They will include mechanisms where the competence requirements of jobs are made public and influence the preparation of learners and the behavior of employers.

For years Monster.com and other online employment enterprises have been leveraging their troves of job listings and résumés to map competence and employment trends. As described by Ryan Craig and Allison Williams in "Data, Technology and the Great Unbundling in Higher Education" (EDUCAUSE Review, September/October 2015), LinkedIn is in the process of executing its strategic intent of positioning itself to serve as a competence marketplace for the 3-billion-plus members of the global workforce. It is developing software tools and interfaces to parse and match competencies from job descriptions and résumés and interface tools to bring these offerings to its audience – including many college and university students.

13. Design Thinking as the New Liberal Arts is a trend that reaches the core philosophy of many higher-education institutions. A vanguard of supporters is promoting the use of easily accessible design-thinking principles and practices to form the fundamental basis for undergraduate education replacing the traditional courses of the liberal arts.

Design thinking can be represented in a wide variety of models and processes, but we've found there to be a strong set of similarities across the many models. Design thinking is problem based in nature, has tools for creating choices through ideation, employs other tools for making choices through convergence, and finally iterates prototypes of possible solutions through to implementation of ideas. It is a key element of entrepreneurship methodologies.

Late in 2015, Harvard Business Review featured a series of articles on how design thinking is being used in the corporate world not just to design products, but to devise strategy and manage change. In a recent article, Peter Miller provides a wonderful background and description of the efforts that Stanford University, led by President John Hennessy, is making in rethinking higher education. Another application can be found at Smith College. The list goes on, where we see traditional liberal arts schools and programs using principles from design, innovation, and entrepreneurship to redefine what were once thought to be hallowed approaches to learning. We believe this idea is going to catch like wildfire across higher education.

The Learner's Journey:
4 Learning-Space Scenarios That Reflect 13 Dynamic
Trends Impacting the Future of Education

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