Innovation Ecosystems for AI-Based Education, Training and Learning
mediaX at Stanford University Conference
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616 Serra St Stanford, CA 94305

Welcome: *Martha Russell, Executive Director, mediaX*

Forces for Change in Ecosystemic Innovation
Martha Russell, Executive Director, mediaX at Stanford University
1. Innovation ecosystems are sustainable business networks built on collaboration, meant for producing innovation in a non-linear way, through the collective action of legally independent actors that increasingly relies on horizontal, peer-to-peer linkages among different agents.
2. They are differentiated from other types of business networks by patterns of interactions, receptivity to feedback and innovation capacity in responding to changing conditions.
3. Seen through the lens of complexity thinking, innovation ecosystems are open non-linear systems characterized by multi-faceted motivations and undergoing persistent transformations through recombinatorial patterns of interactions, implying a holistic integrity of partners' mutual activities and governance.
4. The vitality and resilience of innovation ecosystems can be fostered by increasing the number of network nodes, promoting the quantity and quality of feedback linkages, encouraging autonomous relational contracts, removing inner and outer communication gaps, cultivating shared vision of interdependencies and collective resources, and maintaining a balance of exploration and exploitation.

Lightening Talks:
AI Frontiers for Education, Training and Learning

Bridging AI Research and Education Practice to Drive Changes in the Ecosystem of Innovation
Bruce McCandliss, Professor, Stanford Graduate School of Education and (by courtesy) Psychology
1. Setting the stage of the eco-system for educational innovation: who are the stake-holders? What limits their engagement and innovation?
2. AI research plays out at multiple, interacting levels of complexity: i.e. neural systems (biological and artificial), the whole developing child, the school classroom and school district level.
3. Systems neuroscience may provide a key level of explanation for a learner's trajectory through a learning environment.
4. Educational systems have increasing degrees of freedom for differentiated instruction and engagement.
5. AI, when combined with insights from the Learning Sciences, may provide decision relevant information to enhance children's development during the early school years, enabling schools to become learning institutions that learn.

Intelligent Textbooks Based on Knowledge Representation and Reasoning
Vinay Chaudhri, Former Head AI, SRI International
1. Simply changing the medium of presentation has no impact on improving student learning.
2. An intelligent textbook relies on knowledge representation and reasoning to provide concept summaries, suggested questions and question answering.
3. The resulting learning gains are in the range of one full letter grade.

Cloud-based Cognitive Services for Learning

Lewis Johnson, President/CEO, Alelo Inc.

1. Cloud-based cognitive services can accelerate the deployment and scaling of AIED systems.
2. Moving to the cloud provides access to volumes of learner data, which has profound implications for instructional design.
3. Technical and organizational barriers offer opportunities for innovators to occupy the high ground in the digital learning landscape

The Mandate for Clean, Trustworthy Data for AI-Supported Human Learning

Timothy Kasbe, CIO The Warehouse Group, New Zealand

Why Did Life Sciences Clusters Emerge in Some Cities but Not Others? The Secret is the Cooking, Not the Ingredients

Walter W. Powell, Professor, Stanford Graduate School of Education and (by courtesy) Sociology, Organizational Behavior, Management Science & Engineering, Communication

1. What factors make distinctive network configurations possible at particular points in time and space? How does a collection of diverse organizations emerge and form a field?
2. The critical factors that allow networks of collaboration to emerge are: the presence of multiple types of organizational forms, an anchor tenant that protects the value of openness, and cross-network transposition.
3. Diversely anchored, multi-connected networks are much less likely to unravel than networks reliant on a few elite organizations, and the organizing practices of such networks are more likely to be resilient to perturbations.

AI's Impact Education, Training, and Learning: Potential and Limitations

Paulo Blikstein, Assistant Professor, Stanford Graduate School of Education

1. When we talk about machine learning or teaching machines, we're also altering our metaphor of human learning.
2. The use of teaching machines has an 80-year history, but the results are not encouraging.
3. Educational researchers mostly know why these attempts fail, but communication between educators, cognitive scientists, and technologists is faulty.
4. Some areas of application of AI have shown promise in education, but their business models are still ill-defined.
5. The biggest impact of AI in education might come from applications that do not even exist today, and will likely not come from the replacement of teachers or legacy education infrastructure.

California's Evolving Policy Context for Post-Secondary Learning in the 21st Century

Michael Kirst, Emeritus Professor, Stanford Graduate School of Education & President, California Board of Education

1. California lacks the public postsecondary capacity to satisfy the current workforce and future need for 4 year college degrees, and the increasing number of K-12 students who meet entrance qualifications.
2. Data about the ecology of postsecondary entities providing lifelong learning is badly lacking. We found 350 providers in the San Francisco Bay Area, but only about a third were in federal data bases.
3. The California Master Plan For Higher Education, approved in 1960, is not designed to meet the current or future workforce needs of the state, and has no strategy to meet the needs of students 25-55 years old, or integrate a complex private postsecondary education sector.

Lightening Talks: Ecosystem Cases

What can AI Do for Learning and Understanding?
Prasad Ram, Founder, Gooru

From Free Online Education to Professional Development - Ecosystem Change in the MOOC Market
Hannes Rothe, Assistant Professor, Freie Universität Berlin

1. The value proposition of online courses has shifted since the emergence of MOOCs in 2011
2. MOOCs and their platform ecosystems have evolved, with new actors, new educational activities and new technologies

Building The Platform Learning Company – Case Study of an Ed Tech Company
Kaisa Still, Principal Scientist, VTT, Finland

1. Platforms ecosystems are characterized by interactive value creation, sharing and capturing.
2. "Claned," a Finnish Ed-Tech startup, illustrates these interdependencies.
3. Digital platforms can operationalize some aspects of the ecosystem.
4. Synergistic interactions and transactions among entities within the ecosystem energize the ecosystem as a whole.

Expected & Unexpected Transformation Issues in Building a Learning Ecosystem
Tamara Carleton, Stanford Foresight & Innovation Program

1. Begun in 2007, SUGAR is a semi-formalized global network of university teaching teams overseeing student design projects sponsored by companies. These projects are taught in at least eight different countries on four different continents.
2. Generally, all foreign teaching teams follow the methodology of the award-winning ME310 course, which has been taught at Stanford University since 1967. The curriculum provides a central organizing theme across network groups.
3. A visual map was needed to explain network relationships and is now done as an annual exercise.

Lightening Talks: The Micro-Macroscope View

Using AI for Clues to Solve Social Problems
Yuri Nakao, Researcher, Artificial Intelligence Laboratory, Fujitsu Laboratories Ltd.

1. Social change requires individuals to make different decisions, and it is often challenging to change existing decisions simply by presenting information that speaks to the "greater good".
2. Information received through a social vector, particularly when presented by individuals with varied lifestyles and experiences, can help moderate social issues by engendering empathy and creating the conditions for change.
3. AI can act as a catalyst for progress on social issues by connecting us with a plurality of social groups and facilitating productive communication, collaboration, and change.

Discovering Opportunities in Cross-Industry Ecosystems
Neil Rubens, Professor, Transport and Telecommunications Institute, Latvia

1. Cross-industry opportunities and threats tend to go unnoticed; both internal and external analysts tend to consider relatively few and mostly adjacent industries.
2. An ecosystemic-view provides visual assistance for spotting emerging cross-industry trends, opportunities and threats.

Making Sense of Emerging Ecosystems Using Visual Analytics
Rahul Basole, Associate Professor, Georgia Institute of Technology

1. Ecosystem intelligence is a critical capability for every stakeholder.
2. Computational + visual analytic methods applied to heterogeneous data and data types can reveal valuable new insights.
3. Structure and strategy have a symbiotic relationship.

Artificially intelligent capabilities are being introduced into teaching and learning products and services. Relying on peer-to-peer linkages and horizontal relationships, the collective action of independent actors using AI is reshaping education, training and learning.

Expert teachers and coaches provide responsive feedback to learners to help them discover rules, patterns and insights and practice applying them. Advances in Artificial Intelligence have codified the design of feedback, leveraging rule-based software to analyze the user (and sometimes the context), filter content, and present personalized and interactive experiences. Advanced teaching agents can identify where learners have demonstrated competence and even generate new problems to improve instructional materials and comprehensive testing. Innovative business initiatives are developing specialized tools that include artificial intelligence and enable the exchange of data for these experiences.

The mindsets, organizational constructs and technological systems of multi-sided markets, platforms and ecosystems offer opportunities to reframe how we think about product development and service delivery for education and training, including certification, credentialing and accreditation.

These emerging networks of startups with AI-based learning, education and training are reshaping the edtech industry. As innovators move through seed and early stage deals to expansion and acquisition, the relationships among founders, key employees, board members, and financing organizations inform opportunities and choices in this new business landscape. Together they create the Innovation Ecosystems of AI-based education, training and learning.

mediaX at Stanford University is a forum, an incubator of ideas, and a programmatic framework to encourage and support multi-disciplinary research initiatives. Our initiatives explore how understanding people can improve the design of technologies – in the areas of learning, mobility, collaboration, entertainment and commerce.

As the affiliate program to Stanford's H-STAR Institute (Human Science and Technology Advanced Research) in the Graduate School of Education at Stanford University, mediaX programs are grounded on respect for different approaches to discovery and centered on our belief in the power of collaboration – between business and academic researchers, on campus and around the world.

In trusted relationships, aligned on questions that are important for the future, mediaX collaborations seed campus-wide research and coordinate industry interest. Through dialogue and collaboration, university and industry researchers challenge what we know now and stretch intellectual resources to gain new insights relevant to academic and business collaborators.

Together, we pursue new insights on how information technology affects people's lives, how to better design products and services to make them more usable, and the innovative use of communication technologies to improve the human experience.

To become a member of the mediaX Community, please talk to or email Martha Russell martha.russell@stanford.edu

Thank you for attending the mediaX **Innovation Ecosystems for AI-Based Education, Training and Learning Conference**.