

Distinguished Keynote Paper: **Professor, Your Job Is in Danger !**

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ABSTRACT

Technology and the world are rapidly changing and at an accelerating pace. Present educational foundations already laid, technology, and advanced human and machine thinking portend radical changes in the professoriate. These changes will advance education processes and enhance individual learning beyond previous frontiers. Those who heed the coming changes and participate in their invention will prosper; those who do not do so will be relegated to other parts of the economy.

Keywords: Big Data, Artificial Intelligence. Learning Theory, Psychedelics, Intellectual Capital, Abundance, Singularity

1. Introduction

Taken together, existing templates, data expansion, artificial intelligence (AI), learning theory, etc., threaten the jobs of the traditional professoriate. The ability of 'entities' to gather evolving data and transcribe that data into prescriptible and actionable recommendations, pathways, and incentives presents a threat to the professoriate as we know it. The application of artificial intelligence in setting learning incentives and outcomes already works in video games and Internet education resources.

That different individuals learn in different ways is well-known, therefore the application of learning theory in a differential way, call it mass customization for learning, is now possible. There already exists an example of the disaggregated professor in a very successful nonprofit education organization. That university has over 75,000 students using a competency-based distance learning structure.

This keynote address synthesizes a number of areas that will affect the professoriate in the years to come. The address is about change, change that has occurred and change that must occur if the academy is to thrive. This observational thought piece is one where the intention is to provoke the reader and the listener to plunge deeper into the matters that this paper presents.

2. Singularity University

Articles from Singularity University (SU) (Singularity University, 2019) and simple observation-with-synthesis form the backbone of this paper. To wit, most references cite easily accessible webpages. Just think about that. Twenty-five years ago people would have been scrambling through a library trying to access references to read their content. Our world has changed remarkably in the past two and a half decades yet those changes pale in comparison to those that we will see in the next five years.

One of the works of Singularity University is to serve as a channel for futurist thought and for updating revolutionary changes in our world. Founded in 2008, Singularity University is *the* thought leader for exponential growth. Singularity's website is a .org, not a .edu. The explanation for that lies in what founding executive director and global ambassador for Singularity University, Salim Ismail, explained at the AACSB Dean's Conference in 2017, Singularity cannot get accredited because the institution changes too fast. The accrediting bodies are in danger, as is the professoriate, exactly because of their stodginess. They should be in danger, for the ten-year review process and the intertemporal restrictions on change are stifling and constraining education advancements.

Lest you think this is an advertisement for Singularity University, be aware that it is indeed. However, this is not for SU's benefit, it is for the reader's benefit. This comes with no investment or involvement in

Singularity on my part. I simply think Singularity provides a unique and central role in thought leadership, leading the way into the future.

3. Big Data

Every day, entities such as Google, Facebook, Target, Amazon, and the NSA collect immense amounts of data. Within their own specialties, these entities use the data they collect in a variety of ways including flashing advertisements on the screens of Internet users, developing shelf assignments in stores, providing coupons, tracking preferences of consumers, and, in the case of the NSA, keeping tabs on potential threats for national security reasons. In the latter case, this is mirrored in countries across the globe. Unless you are using a VPN, they are also tracking your Internet movements.

The collection of genetic data, voluntarily and involuntarily, widens each day. If you have had a blood draw or a mouth swab in the past five years, somewhere someone has your genetic information. Perhaps you have used one of the genetic analysis companies to learn your genetic background or find out disease predispositions. There are benefits to this, including predictive outcomes for offspring, probability mapping, and CRISPR therapy (Fan, 2019-1). At the same time, you are exposing yourself to predispositions with regard to your health status, and that of your progeny.

Do universities collect data on how an individual student learns, what a student's preferences are, what a student's learning strengths and weaknesses are, etc.? If they do, it is in a very rudimentary way, call it a 1960's data compilation. Part of this is out of privacy concerns, but the stodginess and outdatedness of the academy in developing ways to facilitate individual student learning is remarkable when the most important thing that a university can be about is *change, constant change*.

With the availability of computing power today and in the future, particularly on university campuses or accessible from university campuses, along with the ability to collect data and respond to that data in real time, little excuse is left for using a Neanderthal approach (with apologies to the Neanderthal community) to learning. The academy (professors, universities, and accrediting bodies) continue to mire themselves in minutia instead of simply observing what is transpiring in technology, business, and espionage communities, then acting strategically instead of myopically. Mass customization is the future for education and learning, regardless of whether the academy wants to engage or not.

4. Artificial Intelligence

In research performed at the Naval Postgraduate School, a computer learning system was created to evaluate helicopter pilots that get lost in their air environments. A neuroscientist and a psychologist worked together on a simulation system that got the pilots lost then evaluated eye movements that contained "code" that revealed that the pilots were lost. In the initial study of 19 pilots, only one realized that he was lost and sought to correct his flight. The other 18 pilots did not consciously realize that they were lost, but their eye movements revealed that they were searching for a basis upon which to fly.

The result of this NPS study allows an eye movement sensor to transmit information to the flight computer that then informs the pilot that he or she is lost. The pilot can then enact measures to find new positive bearings that return the aircraft to flight integrity. While this example is largely mental and brain/muscle memory oriented the next involves full-on psychological patterning by machines.

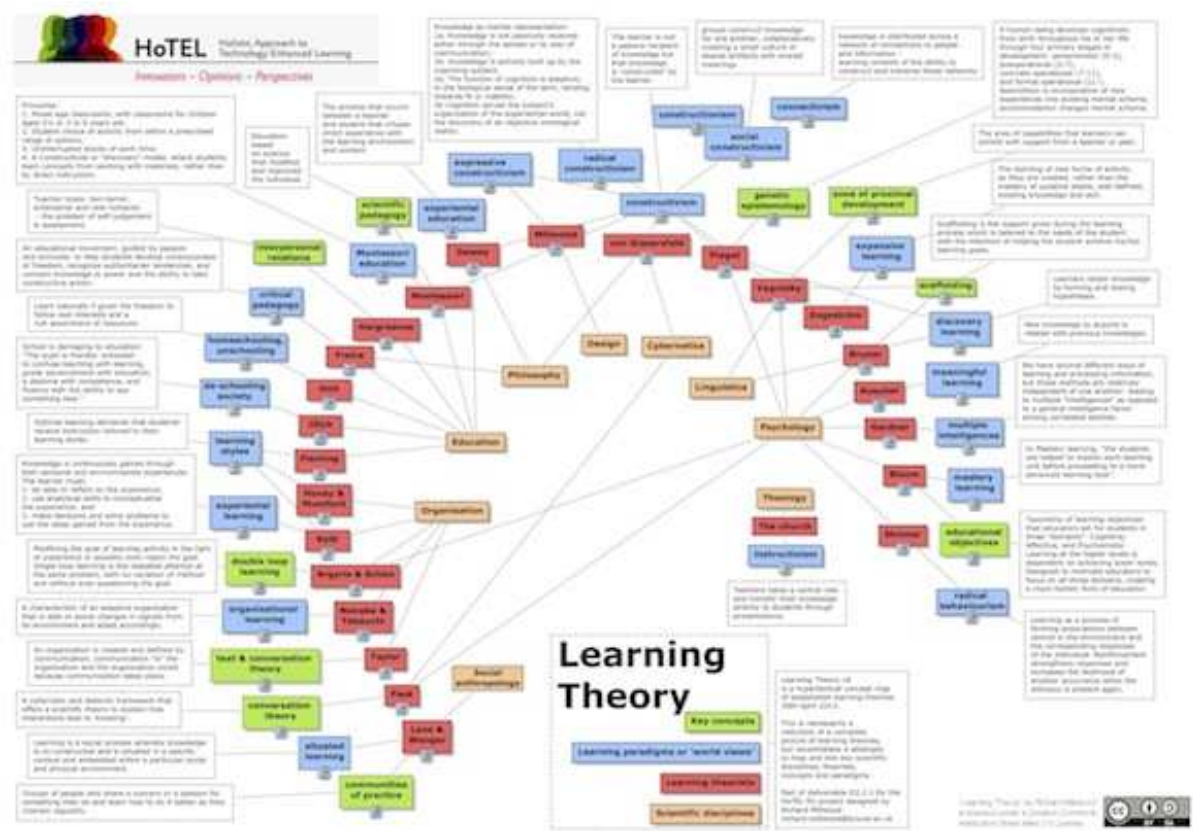
In work done by Google researchers, machines using artificial neural networks were able to mimic human Gestalt activity (Fan, 2019-2). To do so, machines must "behave" in generalizable ways and be able to fill in the details. Think of incomplete patterns that our brains are able to complete. Now, machines are able to do the same thing.

These are small representations of the existing and coming abilities of AI. Some believe that AI will exceed the human brain within ten to twenty years. Ramirez reports that, "Futurist Ray Kurzweil famously predicted that 'By 2029, computers will have emotional intelligence and be convincing as people.'" (Ramirez, 2019-2).

5. Learning Theory

Without performing an exhaustive literature search and detailing a myriad of learning theories and the attendant structure of same, suffice it to say that different individuals learn in different ways. Also, the individual may be learning in different ways depending upon the subject matter and/or left-brain vs. right-brain bifurcation. My prediction is that using the bridges between the two brain hemispheres will become increasingly important in the future and will be a fundamental learning function.

Presented below is one example of the variety of learning theories by Richard Millwood (Millwood, 2013) licensed under a Creative Commons Attribution-Share Alike 2.0 (Creative Commons, 2019). The purpose of this is not to have the reader read the unreadable, but to show the range of learning theories and the levels that go with them.



Learning theories address the processing of information and knowledge, absorbing same, and subsequently retaining, applying and leveraging that knowledge. This is the matter about which the professoriate ostensibly exists. In the professoriate, we would say that we want to teach critical thinking, but I doubt that our definition of critical thinking is even close to what it should be. If it was, we would be involved at a grand scale in mass customization of learning.

If we know so much about learning and we have tools such as AI to analyze how an individual is learning, why is it that we cannot develop mass customization of the development, presentation and learning/assessment sequence of the material that we are teaching? That is, through technology each individual accesses the information and knowledge through an interface that learns from the individual the optimal manner in which to teach, incent and assess that particular individual's progress. There are video games that already do this. Part of the reason is that the professoriate would change in ways we cannot yet see. The changes this foreshadows would literally take the professor out of a classroom, and even a distance education venue. The professoriate as we know it would cease to exist and there is great resistance to that prospect.

6. Western Governors University

Western Governors University (WGU) represents an example of an intermediate step to mass customization of learning. WGU is a private, nonprofit online university that was established in 1997. When founded, online education was nothing new; but the operating model that WGU follows is.

Western Governors University uses a competency-based approach to student learning, but to this paper the applicable part of the WGU model is the disaggregation of the role of the professor. WGU does not centralize the sum of content development, content delivery, student course assessment, student course advising, and overall curriculum advising (personal mentor) into one professor. These components are separated into specialists who execute these roles in an autonomous manner yet with strategic cross-communication.

The significant attribute of WGU to this paper is that disaggregation of the role of the professor has already happened and been in place for over twenty years. Given that, doing the same in the presence of Big Data, AI, and learning theory is not a large leap.

7. Abundance

The 1990s produced the emergence of work on learning organizations (Senge, 1991) and intellectual capital (Edvinsson, 1997, and Roos, et.al., 1998). Concurrently, the decade produced development of new growth economics (Romer, 1993 and Arthur, 1994, 1996). Early economic theories of knowledge understood that knowledge is an economic good unlike economic goods that are the fundament of neoclassical economic theory, which is grounded in scarcity and the law of diminishing returns.

This is so because the goods of neoclassical economic theory are rival and exclusive. For example, consider an apple. You and I are rivals for the apple, for if one of us eats it the other one cannot. This also makes the apple exclusive to its owner, that is, fundamental property rights. If I own the apple, I might be induced to relinquish my ownership to you in exchange for something that is of greater value to me. Let's say that is 15 RMB. Likewise, your willingness to give me 15 RMB in exchange for the apple indicates that you are relinquishing something that is less valuable to you than the apple. That is to say, the apple is worth more than 15 RMB to you. The gain that each of us experiences in this exchange is captured economic surplus of the exchange.

The apple is a simplified example of the basis for our international markets, markets that create great surplus. However, this example does not explain knowledge as a good. Why? Knowledge is a good that is not rival and not exclusive. Unlike the apple and beyond patent, copyright and trademark protections, knowledge can be used by all of us. That is, the application of a piece of knowledge can be experienced by each of us applying it in many different ways. Using the same good by many people implies a new law, the law of increasing returns, which leads to abundance.

Entrepreneurs and practitioners, most notably Ray Kurzweil and Peter Diamandis, who worked with and studied knowledge also understood that this would lead to abundance, instead of scarcity. Recently and some twenty years after the Romer and Arthur laid the foundations, Diamandis and Kotler (2012) provide an entrepreneur/practitioner view of the increasing return phenomenon. One of the cornerstones of this is the idea of exponential growth, something experienced with great surprise by some firms.

Indeed, we are beginning to see examples of leveraging knowledge in many different ways. In the physical arena, new and inventive applications of composite materials have and are emerging in aerospace, medicine, and sports. In the cyber arena, we observe the knowledge behind operating systems being leveraged into free device applications. All of this reveals the new age of abundance that is replacing scarcity.

Truly free education is not out of the question. Yes, countries like Sweden currently offer "free" education, but it is not really free. Taxpayers are footing that bill. In contrast, once knowledge is mounted on an AI platform, students will be able to access the learning module from anywhere in the world. As they begin the learning process, AI learns how the student learns, including the language the student prefers, and assists the

student to truly grasp the knowledge, including critical thinking. Once the installation gains a critical mass of students, the marginal cost of the education approaches zero, remaining free to the student from the beginning.

8. Conclusion

What does all of this mean to education? First of all, the knowledge-good abundance is producing great wealth, greater wealth by far than has ever been obtained. Wealthy nations are already applying pockets of universal income at small levels. Universal income will come in the future as will an era of many free goods.

Second, technology has replaced labor for a long time, but what has occurred is nothing compared to what is to come. The age of autonomous vehicles will displace truck drivers and taxi drivers. Technology is and will replace labor, and the professoriate is labor. Currently technology is replacing professors through the economies of scale process and in the not-too-distant future students will be taught by advanced artificial intelligence where the machine learns from the student how the student learns, and applies that to the “instruction” in an ongoing process.

The academy has made great strides in developing theories of learning, but in the context of rapid technology changes it has virtually failed in the application thereof. Further, the academy severely lacks in the application of big data techniques and Artificial Intelligence in the learning process. The application of big data techniques coupled with AI will produce mass customization where each learner receives a learner specific education. Education has a very large leap to make in order to achieve mass customization of learning. If it does not do so, then technology companies will take over and supplant the academy, and the professoriate will disappear. Perhaps the Davis and Botkin’s (1994) prediction that business will take over education will come to pass.

Professor, your job is in danger!

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[Author's Background](#)



Dr. Doug Hensler is the President and CEO of Alfred Douglas Associates. He previously served as the W. Edwards Deming Distinguished Professor of Management at the University of Colorado at Boulder, followed by serving as Dean of three endowed and named business schools in California, Kansas, and Wisconsin, respectively. Doug also served as the Provost of the Naval Postgraduate School in Monterey, California. Doug's current interests span finance, learning theory, data science, artificial intelligence, value creation, strategy, change management, learning organizations, intellectual capital, organizational structure, and futurist studies. He has consulted for numerous companies including Louisiana-Pacific Corporation, American Airlines, Texas Utilities, Fulfillment Corporation of America, Micro Motion, Inc., Sulzer-Bingham, Electricity Generating Authority of Thailand, and Sporian Microsystems, Inc. Doug holds a PhD in Finance, an MBA, and a BSE in Aerospace Engineering, and he is a licensed professional quality engineer in California.