Virtualized Higher Education:

Where E-learning Trends and New Faculty Roles

Converge Towards Personalization

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Abstract—**Virtual Higher Education is in sharp focus lately with onslaught of Online Learning Platforms (MOOC, Coursera, Khan Academy, Udacity) offering Free Courses in every discipline. Originally targeted at populations in underdeveloped countries not otherwise able to offer a world-class education, these courses have become popular and mainstream in developed countries being free, online and caters to most professionals to build skills and explore career changes. Current delivery format robs an academic the ability to express their teaching style. The PLErify Application seeks to address the need to support, through a 'DIY approach', an Academic's teaching style and retain ownership of materials. PLErify is discussed in the paper relative to the Robots role vis a vis the traditional Professor's role and the prevailing thought of the best ways to energize and modernize current teaching methods.**

Keywords— e-learning; curriculum design; virtual education; personalized learning; learning management system; faculty teaching style; plerify; artificial intelligence

I. Introduction

This paper attempts to illuminate the trend in higher education in an era of course massification (MOOC Coursera Khan Academy Udacity) and, as it confronts the challenge of integrating the use of technology to enhance the teaching process but more importantly to unburden the faculty as it grapples with resisting change to age-old practices in fear of losing control over their prized professional positions and status in higher education.

II. Content Collection and Curation

A. Content Collection

The two projects entrusted to the author to build and complete were the Telemedicine Graduate Course (2005-2006) and the Pandemic Flu (2006-2007) for Emergency Personnel. Before proceeding with the build she had to immerse on gathering digitally available reading materials in the form of journal articles, periodicals, book chapters from reputable digital libraries that had the keywords 'Telemedicine' in it. To view the Telemedicine subject matter from all angles, she had to understand the definitions, explore its history, the technologies used for it, the cost involved, the industry drivers, the government support, the practicality and acceptance of the technology and the continuing evolution and possibilities for future mainstream application. Requiring 'complete understanding of an unfamiliar subject matter' phase of the project took the most time where this Author immersed herself in the various reading materials she compiled from the various digital libraries spending an altogether six months reading up, analyzing, synthesizing and organizing the subject matter into a decent viable course curriculum for a full-fledged Graduate Course for UCDavis Medical Informatics Graduate Students.

The same process was repeated for the other project on Pandemic Flu, yet another subject matter unknown to the Author. Based on these readings the author formulated a Curriculum (see Fig. 1) for both the projects which were approved by the Instructor and the Project Manager (see Fig. 2). Only on approval of the curriculum by the Provost of the University of California specifically for the Telemedicine Graduate Course did the digitization of materials commence.

Ideas generated from the readings were combined with the scant media assets existing in the UCDavis Telemedicine Center. Unfortunately, those assets consisted merely of images of telemedicine equipment and equipment installs at the UCDavis Health Center as well as images of how-to-install Telemedicine Center Clinics in remote areas in California. Most of the images were of poor quality and had to be re-rendered to be usable. Other assets that were gathered were videos of Telemedicine Full Time Staff used for their web training consisting mostly of local telemedicine practices (such as installations of equipment, organizing telemedicine clinics, staffing, recruitment, legalitites and consults) for rural telemedicine practitioners, which, after editing formed the basis of making the talking heads in the online course.

The Author was made to understand that those pre-recorded videos will have to form the basis of the format to be adopted, e.g., *talking head on the left of the navigation bar with corresponding content on the right hand window.* Focused on telemedicine practice in California specifically and the role of the Telemedicine Center at the University of California Health System, the pre-recorded videos were deemed inadequate for a full-fledged graduate course even though they mostly covered practical application. Thus, to fill in the huge content gap for an actual course, additional recordings for added content became critical. A total of two recording sessions by CHT media staff were conducted covering:

- History

- Evolution of Telemedicine

- Evaluation of Current Practices

- Assessment and Satisfaction with Telemedicine
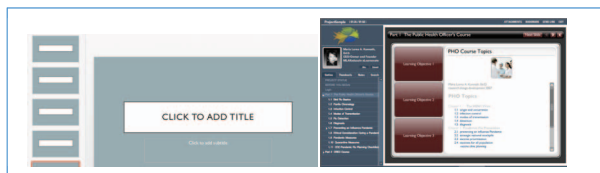
- Future Telemedicine Technology and Practices.

Figure 1. Curriculum and Syllabus for the Telemedicine Graduate Course

Figure 2. Topical Hierarchy Pandemic Flu Curriculum

TABLE I.   USER INTERFACE COMPARISON FOR PROJECT 1 AND PROJECT 2

B. Digitization

The digitization procedure for both projects were identical. Basically, images, video, simulation illustrating hard to explain ideas and subject matter were organized in their corresponding file folders. The sequence was to search by keyword, sort, select and file media assets. Screen capturing is a very handy skill as was combining a series of images in a single file to illustrate an idea. News coverage in the form of videos and simulations of techniques and technologies as described in both projects where compiled wherever allowed. The remaining bulk of content building was selecting which ones to allocate, elaborate, repeat within the powerpoint version of the syllabus. For project 1, the final product was a powerpoint file consisting of more than a hundred slides divided into 4 modules (see Fig. 1), each with several chapters and subchapters.

C. Software and Hardware

Since both projects were completed during the period 2005-2007, the Author had to use the popular CD/DVD mode of delivery technology for final products. For Software, there was extensive use of the then Macromedia (now Adobe) software Captivate, SWF Maker, Microsoft Expression Suite, Photoshop, Articulate Suite (installed onsite and home PC), Microsoft Office especially Powerpoint and, Windows Media Maker. For the final version of Project 2, Articulate Suite was used. Though Sakai LMS then being tweaked by UCDavis IET Group and recommended by the Course Instructor as the LMS of choice to deliver the project, a series of failed attempts by students to utilize Sakai (hosted and tweaked at UCDavis' IET Mediaworks) prompted the Author to drop the LMS for the first project and instead use the .ppt method instead. Project 2 (using Articulate Suite) had a successfully much better look/feel (Fig. 3) than Project 1 due to better software and the presence of a generic open-source LMS through the State of California.

III.   EMERGING ROLE OF FACULTY

Faculty cannot ignore the effects of digital technologies in their daily research and teaching lives. Despite strong opposition by traditionalists, use of basic office software applications became the norm in all industries including higher education. Within 3 decades, use of email, tablets, and smartphones prevailed over refusal to very slow adoption (due to scholarly debates on merits of usage) and adaptation. I say slow because the debate has now shifted to Artificial Intelligence AI (spearheaded by Google, Facebook and other social media, IBM now widespread in largely in Asia and Europe) and its potential effects on all industries including higher education. With higher education becoming unachievable to a middle class family in the US and tuition cost remain in an upward trend, it is highly conceivable to look to technology [1] as a cheaper [5] solution.
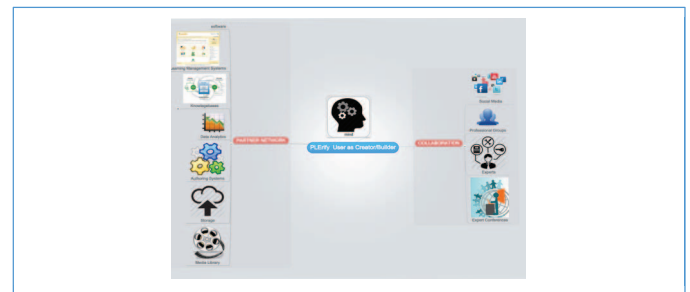
Figure 3. PLErify User as Coursebuilder

Without giving up traditional teaching methods, Faculty need to accelerate their knowledge, use of and application of a plethora of technology tools software, hardware and gadgetry to a level of sophistication and ubiquity that they almost disappear in the conduct of their courses combined with the skill of blending and shifting (tech to traditional and vice versa) with traditional yet technology enriched classroom. Today's incoming Freshmen are tech savvy (e.g.

mastery of desktop, peer to peer networks, sharing and collaboration, remote desktop access to cloud servers) particularly in the use of gadgetry so if a faculty were to teach these kids they need to have a much better grasp and skill on its operation. The challenge remains for Faculty to be inventive in finding digital equivalent of archaic teaching methods (via software tools) to facilitate them to self-create (see Fig. 4) digital versions (eLearning version) of the same course such as utilizing e-books [4] that incorporate embedded animations and simulations, videos within the eLearning course where needed.

A. Pre-AI Phase of Education and the Do-It-Yourself Culture

There is little to no doubt that with Deep Learning, Machine Learning, Big Data and Internet of Things IoT, Artificial Intelligence will disrupt Education in big unimaginable ways. It is only a matter of when and how. A prevailing yet a very scary trend of thought is where faculty plays almost no role in offering, syndicating and delivering courses which, to those outside the university aptly describes as the massification of courses. In Universities however, few scenarios must play out to not let the machine become the controller (as evident in the technology literature envisioned by Sebastian Thrun, Oliver Dynes, John Hennesy, Salman Khan). Professor must remain in the Driver's seat, play a lead role but be cognizant and completely prepared to face added responsibilities as a consequence of the changes--from programming robot (Fig. 5) consciousness to designing robotized courses through aggregated content…i.e. automated pulling of content from a variety of resources. These new robot-driven challenges in higher education will be manifested as follows:

- Robots (in the likeness of a Professor/Researcher) that are programmed to co-teach/co- research and juggle the myriad roles of the human. This has been and still is being experimented in Japan [2].

- Robots that build Professor courses for delivery to students. Q&A will be handled in a manner similar to SIRI

- Robots which individualizes attention to each student ensuring progress, remediation and success – a feature lacking in a human professor due to time factor.

- Robots that tutor slow or remediating students.

AI-based Course Aggregator (Software-based) pulling different curriculum using Big Data of the same course from many places/universities to a central location where students get to pick and choose a course program of study. These new courses would be very current as it takes into consideration new developments in the discipline though Big Data. Thus, Professors have to respond to new roles imposed on them even before AI takes root such as:

- Professor as Programmer

- Professor as Designer of tech infused courses

- Professor as Builder of Learning Environments in courses to an ever evolving course materials that are constantly updated on a per-offering status

- Professor as sole Owner of Tech-Based courses

- Professor as a do-it-yourself course developer and builder

Figure 4. Robots Built to the Likeness of a Professor

With direct involvement and experimentation occurring at an exponential phase at Google, IBM, Facebook and Microsoft regardless of how and what the perception may be in higher education, AI will advance regardless of acceptance or lack of. If Professors resist and do not claim their stake (alongside new responsibilities) in the virtualization of education, industry-driven AI is likely to gain the most in an AI driven educational landscape where robots predominate and more and more courses will be made available online to anybody for free if not minimal cost.

Dr. Dyens presupposes "a system where students and professors alike are equipped with cognitive abilities that allow them to make new realities built out of merging different environments in AI, Big Data with the Internet of Things" [2] so that the Professor programs the machine [7] that drives and not the machine that drives the Professor. While debates and experimentation at MIT, Carnegie Mellon, Harvard and Stanford continue to grow in Artificial Intelligence, PLErify App remains a precursor to the above scenarios. Interestingly, academe being at the forefront of tech research are last to apply and the slowest to get in the tech game making it a scary thought when all too AI, Big Data and IoT altogether suddenly changes the game.

It is known that groups in the tech industry hint of a future where no human teachers and professors exist just because of the constant suggestions on 'adding consciousness to a computer'. Such ideas are hinted in E-Learning Conferences from independent educational research organizations and private entities rather than the academic sector where countering arguments against a supportive audience renders the discussion moot if not irrelevant. In trying to blend the here and the now to the future it is important to recognize the need to create Do-It-Yourself culture given that AI will demand that each user be able to program their future robots and software bots to complement their teaching and research as well as manage interaction with students.

Embodied within the PLErify coursemaking culture (Non-Provisional Patent Filed with the United States Patent and Trademark Office USPTO) is the do-it-yourself mindset for electronic coursebuilding that depends entirely on what a builder brings to the project that consist of (an interplay of a) a variety of cognitive and digital skills with an acute ability to combined digitally convert abstract ideas into a viewable medium.

IV.   ORIGIN OF THE DIY CULTURE: PLERIFY CONCEPT

Figure 5.   The PLErify Application

The PLErify (see Fig. 5) concept was an idea that germinated two years after completion of project 2 in 2007 as a result of the author's ewflecion on her coursebuilding experience at the end of her Analyst Contract with the University of California Davis to build two e-learning projects in the absence of a team (notwithstanding the verbal agreement that she was going to have a team to work with and a situation made worse by the absence of digital resources). Her experience at researching, designing, authoring and finally delivering the final products told her one thing. It was possible with the power of e-libraries and digital creation tools which she fully harnessed to the fullest purchasing software tools to build the two project's media assets.

That experience sparked an idea in the author's mind that Professors (are already domain experts of their specialization) can in fact self-build electronic versions of their course partially or fully or, as a mere complement to the classroom curriculum and all that they needed would be an organized set of tools to Research, Analyze, Author and Deliver. It is that realization that the PLErify application concept became a reality after successfully completing those projects. PLE stands for Personalized Learning Environment and PLErify as a word means building in a personalized way. In this environment and using the tools encased within the environment the user (through a subscription fee) curates and collects content from e-libraries through downloaded scholarly materials.   After collecting reading materials and forming a general idea for a curriculum user then sorts and organizes the various themes, dissects the sub contents and identifies complex hard to understand topics. Focusing on the hard to understand themes meant utilizing mixed media methods, data analytic and visualization tools.

A Coursemaker organizes the Syllabus of the E-Learning Course project. When ready to put together a self-running course, user selects an eLearning platform he/she finds most comfortable which means choosing within Powerpoint which

plugin to use e.g. Articulate, Easy Generator, Knowledge Vision or Adobe Presenter. This method when packaged results in a .zip file.
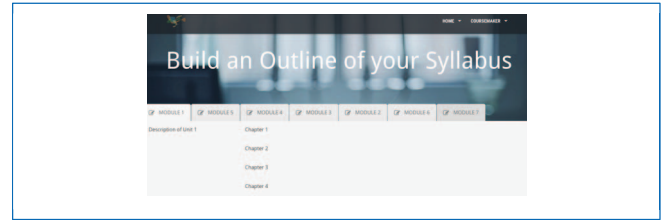
Figure 7.   The Coursebuilder

A. *Research*
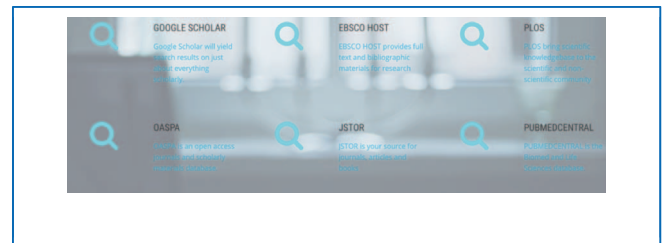
Figure 8.   Research Tools

What does a Professor do when his/her course materials require updating, class exercises begin to look very similar to previous years and/or need additional upgrade in content due to advances in the field in a fomat fit for online learning? Being online would surely be the best recourse and the wonders of googling keywords, keyphrases would reveal immense collections of resources in the form of articles, white papers, links, images, simulations, videos, software and hardware is a bottomless but wondrous pit. In the PLErify App the research (Fig. 8) resource collection in the   form of digital libraries is mostly fit for the US situation but usable to other countries too. Herein lies the challenge, downloaded articles must be read, reflected on for overall as well as situational contexts. The course's robustness rely on faculty-designer-developer's skill in all the areas of reading/understanding/making interconnections and reflecting within a larger whole in the course puzzle.

B. *Analytics*

Figure 9.   Analytical Tools

Analytic (see Fig. 9) set of tools are intended to strengthen arguments on concepts, theories and principles. These tools aid faculty in demonstrating trends, relationships, causation, signific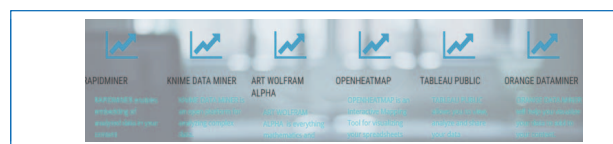ance, quantity, comparison and differentiation. Many tools exist some more discipline specific but most are applicable to all disciplines. With tools always evolving and for the sake of simplification, the collection selected are those ones adaptable to most discipline area. Frequent use of these tools in building a course is highly recommended for the sake of the enthused learner who frequently galvanizes prior knowledge with existing ones in his cognitive frame.

C. Authoring

Authoring (see Fig. 10) tools are the most fun to use of the set in the overall coursebuilding design process. This is where the user gets to show their creative genius in the coursebuilding process.

Figure 10. Authoring Tools

Familiarity with faculty's personal desktop applications is when using the PLErify Authoring Apps with the experience being very transformative once mastery is achieved. The mostly text-based content comes alive with moving images, graphics, equations with graphical equivalent and best, is now viewable digitally. The biggest challenge to overcome however is developing the skill of organizing all the content. It is easy to organize in a hardcopy (traditional materials) since materials can be physically organized. Not so easy when you have to do it digitally particularly if faculty- designer is a novice but when done a few times, coursebuilding becomes a breeze.

Using the Coursemaker Builder, the course syllabus is transformed digitally showing the sequence and progression of topics. The Coursemaker allows the faculty-designer to make last minute edits to the now 'draft' version of the online course before the course gets transformed into powerpoint slides. These powerpoint slides are not your usual .ppt files because using select plugins it becomes a completely synchronized talking head video or audio narration with slides arranged in a navigation tree on the left where learners can: Browse for a fast course overview; Set up to play automatically (if properly set up by instructor during the file creation process).

D. Learning Management System LMS

Figure 11. Learning Management Systems LMS

The final step in the coursebuilding process is the delivery part through an LMS. The least cost are the notable and very popular open source ones such as ATutor, eFront, Docebo and Moodle. The LMS is basically the container that holds a course or courses. An LMS is an application that typically contain:

- Administrative Features for Managing Content
- Content Uploading/Downloading
- Instructor Schedule
- Student Administration
- Faculty/Student Communication Tool
- Conferencing
- Homework/Project Submission
- Plugins for gamification, .PPT conversion
- Course File Upload/Download

Figure 12. A Summary of The Virtualized Higher Education

V. Summary

The hybridized system is a good transitional model where traditional methods are mixed with new tools to the extent that ordinary textbook will have an interactive ebook equivalent equipped with highlighting features, animation, simulation and graphics embedded through an RIF or some type of bar code. Completely self learning with the abundance of materials and learning platforms at their disposal, digital natives will be hard-pressed to be enthused to attend a class where teachers (slowly using chalk and chalkboard) teaches a general education class of 100 or more students with little to no opportunity for interaction as though it was the 1980's or earlier.

When Professors resist and view these learning technologies as a nuisance, an interference, a distraction instead of a partner, an accessory, a second brain, a means to unburden themselves of the drudgery of traditional course offering instead of appreciating the convenience it affords them if they take a more accepting approach, many positive outcomes can take place.

They are able to conduct their classes wherever they travel while digitally able to access their courses on the network, they can take their course content with them anywhere they are and be able to maintain communications with their students, they can have various options at being more productive giving them a better sense at what it really takes to be creative in their teaching styles. Discovering ways to upgrade their knowledgebases of areas of specialization aware that every specialized knowledge needs regular upgrades. As a Course Developer of their own digitallly transformed courses, developing cognitive and meta- cognitive skills to organize and upgrade course content in a web-driven culture already woven in our daily lives. Making sense of the connectedness of disciplines coupled by the complicated nature in which to transfer those knowledge to students require far more modern methods than students of the '80's, 90's and 2000's are used to.

Is it still pragmatic or realistic not to augment the traditional chalk/board with more exciting methods where a simple equation can be demonstrated in a moving simulation, an immersive environment? Is it not more convenient if a Professor's robot built in his/her likeness were to churn out difficult to grasp concepts and theories outside of classroom lectures and have those clarified before start of the next session? After all, cost of education is steep and failure is no longer an option.

VI. CONCLUSION

Clearly, I have depicted an environment where I, as a Course Instructional Designer, completed two projects despite the lack of resources to base content on particularly the scholarly project for the Medical Informatics Department. Lack of content was lesser of an issue for the second project given the fact that the project manager provided me with a State of California mandated PanFlu Manual to base majority of the Pandemic how-to's and guidelines with the course intended to be more of a training solution. Unfortunately, the agreement that I was to work with a Media Team from beginning to end for both projects never materialized to my disappointment due to reasons not known to me.

Nevertheless, both experiences taught me that faced in the tightest of situations, the impossible is achievable and realizable. Another positive outcome of the experience was realizing that tools, software solutions and creativity are a powerful combination to produce any online course by a domain expert or novice. Yet another very important and very life-changing positive outcome of that experience was the birth of the PLErify concept (Figure 5) to aid to a faculty's transformed digital life in preparation for the phasing in of Artificial Intelligence which puts at risk the irrelevance of the teaching profession (if left unchecked) and faculty unable to adapt to the rapid changes in the realm of education virtualization (brought about by webification of courses, AI and Big Data).

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