# Designing the New Generation of Computer Labs for a College of Education

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**Abstract:** The purpose of this brief paper presentation is to share the experiences of a complete redesign of the computer lab model and the role it can play to foster creativity, innovation, and improve the learner experience through discovery within a college of education. The origin of this endeavor began with the idea to redesign what a computer lab "is" and what it "does" for students, faculty, and staff within a college of education. The paper explores the need and designs to integrate artificial intelligence, machine learning, mixed reality, and other emerging technologies into the teacher preparation model to best prepare future educators who are prepared to be leaders in educational technology.

## Introduction

The purpose of this brief paper presentation is to share the experiences of a complete redesign of the computer lab model and the role it can play to foster creativity, innovation, and improve the learner experience through discovery within a college of education. The origin of this endeavor began with the idea to redesign what a computer lab "is" and what it "does" for students, faculty, and staff within a college of education. The intended purpose of designing a new lab was to provide an exciting and creative space where users can explore and play with new and emerging technologies that can serve a role in education. In other words, the intended purpose was to provide a space in which technology plays a role to ignite the students' passion for creativity and innovation, thus the IgnitED Labs were borne. Core to the mission of the IgnitED Labs is allowing all members of the college of education to have access to the educational experiences it offers. The development of these new lab spaces is ambitious in that a network of labs are being constructed simultaneously to support the students, faculty, and programs of the college across multiple campus locations. In addition to the physical lab spaces being built, an online virtual component is also in development to support distance-based users and provide valuable web-based tools and experiences.

## Need for the redesign

The technology landscape is fast paced and ever changing, with new tools and technologies emerging at a seemingly accelerated pace. For many educators it is intimidating, challenging, or overwhelming to try and stay current on the latest digital and media technologies and what they mean for learning. As a college of education, preparing future educators to not only be proficient in technology but innovative and proactive users is a goal we are striving to achieve through the development of the IgnitED Labs that aligns with the US Department of Education's (2017) stance that:

> No new teacher exiting a preparation program should require remediation by his or her hiring school or district. Instead, every new teacher should be prepared to model how to select and use the most appropriate apps and tools to support learning and evaluate these tools against basic privacy and security standards. (p.35-36)

In many cases teacher barriers to using technology can be influenced by both extrinsic and intrinsic factors. While extrinsic factors such as access to technologies can certainly impact the use, it is argued that a teacher's own intrinsic attitude towards technology matters more when predicting teacher use of technology (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013). Similarly, research around teacher beliefs in technology integration has reported that the greatest barriers of technology use are existing teacher attitudes and beliefs of the technology in addition to their self-efficacy and skillset (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). To address these findings and to best prepare a new generation of educators, we are designing the new labs to be collaborative exploratory spaces that allow users to play and create with emerging technologies that will be part of the classroom of tomorrow such as: virtual (VR) and augmented (AR) reality, robotics, telepresence, Internet of things (IoT) devices, coding, 3D printing, as well as machine learning (ML), artificial intelligence (AI) and advanced electronic and mechanical engineering equipment where applicable. Through the exploration of the technologies in the IgnitED Lab the aim is that teacher candidates will develop a strong intrinsic attitude toward the continued use and exploration of new and emerging technologies. Through the development of physical and online emerging technology laboratories the teacher preparation programs (as well as others) can leverage the TPACK Framework to allows teachers, researchers, and teacher educators to "move beyond oversimplified approaches that treat technology as an "add-on" instead to focus again, and in a more ecological way, upon the connections among technology, content, and pedagogy as they play out in classroom contexts" (Koehler, Mishra, 2009, p.67). By providing an engaging and supportive learning environment the newly reimagined labs will help foster the spirit of intrepreneurship and innovation among students and faculty.

**Curriculum support**

The IgnitED Labs will also serve the curricular needs of several educational technology courses. The new labs will support the faculty and students of the ed-tech courses by providing the technology and expertise to assist in exploring new ideas and incorporating new tools in the educational process to reach their respective course learning outcomes. With the physical locations across campuses as well as online, the new labs are uniquely situated to provide specific curricular support for courses and programs that are running in the respective locations. The newly imagined IgnitED Labs also provide a platform for internal technology infusion workshops and programs for clinical and tenured faculty. Through a planned and cooperative initiative, a small group of faculty would have an opportunity to work closely with the lab staff to develop an individualized program of technology infusion into their own courses to help further increase the positive attitudes and beliefs of technology use in education.

**Additional opportunities**

In addition to the afore mentioned needs for the IgnitED Labs, several other uses have been identified, each presenting a unique opportunity to highlight and advocate the resources and capabilities of the labs and college of education as a source of intrepreneurship and innovation.

First, the spaces can be used to host exploratory workshops and seminars offering regularly scheduled events hosted by lab staff and guest presenters from other academic units. Secondly, the labs can be leveraged to develop partnerships with external organizations. The labs provide a unique opportunity for technology partners from outside of the college to demonstrate and showcase various tools, technologies, and educational use cases. Third, the labs provide faculty and students the opportunity to learn and experiment with various technologies, and opportunities to experiment with infusing them into their respective higher education course curriculum. Lastly, the labs can serve as the platform for an annual faculty showcase.

# Design Methodology

As current and emerging technology changes, so too will the equipment and software within the labs to stay relevant and forward thinking. The selection, presentation, curation, and expectation of the tools and environment will be grounded and supported based on Dewey's Four Natural Impulses (of learners): Inquiry, Construction, Communication, and Expression. Using Dewey's categories, the focus becomes the learning not the technology itself. The IgnitED Labs are committed to staying platform agnostic providing users with a multitude of experiences and platforms that can be explored.

To further leverage the various physical locations, the curation and implementation of the equipment and tools is individualized to suit the needs of each specific space. Given the variety of program focus, and physical

layout of each space (size and capacity), the labs can be adapted to meet the specific needs of that location and provide an opportunity for differentiation among the connected spaces. While all lab locations would share an overlap of core technologies, the various sizes and programs would also allow each space to curate specialized technology and equipment to suit the needs of the local users. The differentiations would give a unique profile to each lab around the university network.

### Reciprocal investment

A key element to the design of the IgnitED Labs is to establish a reciprocal relationship with the users and community in the college of education and the broader university community. By creating a creative space for the users, the intention is that a reciprocal culture will develop to further deepen the connection amongst the labs, students, faculty, and staff. These exploratory spaces are designed for the users, and the intention is to create an environment where the users feel a sense of ownership, and connection, increasing the use of the labs. The users of the IgnitED Labs will also play a role in determining what types of technologies, workshops, and showcases are planned and implemented though meaningful feedback. With the addition of the highly visible and publicly accessible space, this also provides a unique opportunity to share the work and resources of the college with the public to further strengthen the connection between the college of education and the local communities.

### Examples of technology applications

To highlight some of the types of technology discoveries possible in the lab spaces we provide three examples. The first example is exploring virtual reality (VR) and working with this medium to explore educational possibilities from guided virtual field trips to fully virtualized environments. Through the exploration of VR students can evaluate the ability to bring information and experiences to life in an immersive (controlled) environment. It also allows users to explore the opportunities and challenges of developing original content and utilizing the technology to demonstrate innovative performances of understanding of complex topics or ideas across a wide range of disciplines.

Another example is the exploration of the role programmables (small programable robotics) can play across multiple disciplines. In an effort to move beyond simply teaching and learning code, students can work with programmable robots to develop skills and curriculum around incorporating robotics and STEAM activities across a variety of subject areas. By using programmables to engage students in art, or social studies (as an example) creates an approachable pathway to get students of all ages interested in technology, not just the students who have elected to study computer science or information technology.

The third example is the exploration of emerging technologies such as newly developed microcomputers known as systems-on-a-chip or SOC. One of the most recognizable SOCs is the Raspberry Pi, an inexpensive computing device that can be used to develop creative solutions to problems utilizing coding, sensors, and the internet. Using or developing internet of things (IoT) devices can provide a platform for students to explore a wide range of application including physical computing, web development, coding, machine learning, distributed computing, and artificial intelligence.

## Conclusion

With a fall 2018 launch date, the IgnitED Labs will debut as open, hands-on, learner-centered creative spaces where users can explore and play with new and emerging technologies that can serve a role in teaching and learning. The IgnitED Labs are designed to go beyond the scope of traditional computer labs and provide students opportunities to create knowledge, and skillsets through emerging technologies. These innovative spaces allow for users to create and tweak, tinker and play, and ultimately improve the learner experience through their discoveries. The expanded aim of the reimagination of the computer lab is to create a new generation of educators who are passionate about technology and look for authentic and innovative ways in which they can enhance the learning experience.

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