DATA SCIENCE AND CHANGING ECONOMIC LANDSCAPE AS DRIVING FACTORS IN HIGHER EDUCATION

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Abstract

University and College education pursue to be viewed as an important financial investment for professional future, and student families play a significant role in terms of paying for it. For the few years in a row, already during the pre-pandemic Academic Year 2018-19, 90% families with a student enrolled in college viewed college was an investment in the student's future, while 80% of families felt positive in terms of paying for higher education pursuits. That did not change significantly during the pandemic Academic Year 2019-20, as well as the post pandemic during the Academic Year 2020-21. At the same time, Universities and Colleges seized the opportunities to reimagine the curricula focusing on Data Analytics, reinvented delivery methods, and re-designed learning spaces. That resulted in significant gains in class participation, ability to focus, Professor feedback opportunities, learning through multiple means, and student appreciation of the value of costs invested in College education.

Keywords: *Data science, economic landscape, higher education*.

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1. Changes in educational theory and learning

Historically, Thomas Jefferson University (TJU) was an academic medical center with a campus in the center of Philadelphia that has a long history rooted in the graduate health sciences. Philadelphia University was on the city's outer edge has a long history rooted undergraduate education, particularly design, engineering, and business. In 2017 these two universities merged and are now known as Thomas Jefferson University. The East Falls campus, formerly Philadelphia University, has a long history of applied research and had experienced success with a signature pedagogy known as Nexus Learning. Nexus Learning actively engages all learners in a collaborative approach to solving real-world problems and uses a humanistic approach to designing effective solutions (Frisby and Sztandera, 2020).

Educational theories of learning have changed as well. Professors encourage group learning activities following constructivist models. Students work in teams to solve real world problems. Thomas Jefferson University has captured these components and integrated them into Nexus Learning as well as Data Analytics.

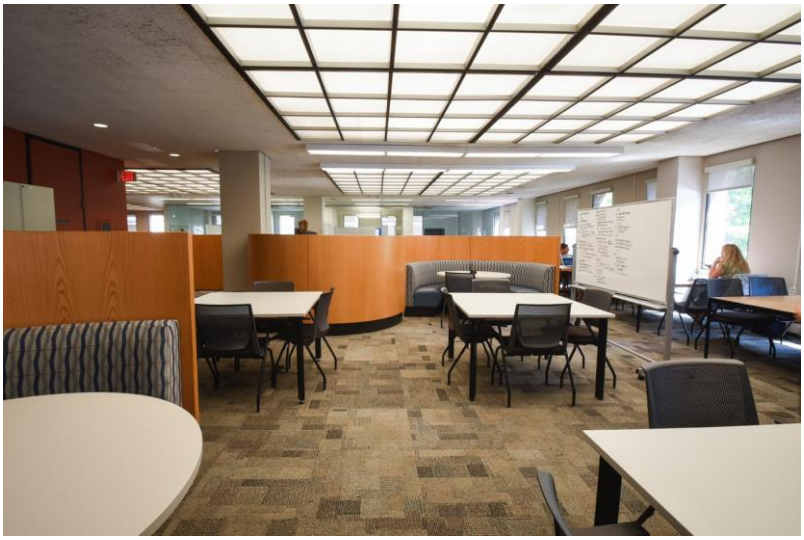
2. Nexus Learning

Active and engaged learning, along with collaborative inquiry, with the use of real-world problems and experiences, supported by the strong integration of the liberal arts and sciences with professional disciplines, has defined Nexus Learning. As reported before by Frisby and Sztandera (2020), campus learning spaces, including libraries and team meeting places, had to be re-designed to represent innovative rethinking of the classroom space that allowed the learning facilitator to be less encumbered by the physical constraints of space, furniture and technology. Those spaces ultimately enhanced student learning and creative teaching. Example of the team meeting places are depicted in Figure 1 and Figure 2.

For example, Nexus Learning classrooms allowed for seamless transitions to different modes of active and engaged learning. The knowledge hubs also optimized collaborative involvement for all students through movable furniture and appropriate technologies that fosters co-creation and sharing of ideas. Our students self-reported significant gains in class participation, ability to focus, Professor feedback opportunities, learning through multiple means, physical movement, stimulation, and comfort level in Nexus Learning classrooms compared to traditional classrooms on campus.

Figure 1. Example of a team open meeting place at Thomas Jefferson University.

Figure 2. Another example of a team open meeting place at Thomas Jefferson University.



3. Data analytics focus

Following the success of the Nexus Learning classroom we believed it was time to reinforce the use Data Analytics across the undergraduate and graduate curricula. It has been over a decade since the Harvard Business Review declared Data Analytics one of the future top job of the 21st century, and the glamour of that job has indeed not shown any signs of waning since then. The days of easily disrupting businesses and markets with iterations of existing technology are definitely over. So is creating "value" through planned practices, as well as optimized supply chains. Data Analytics is a powerful and essential capability for businesses to be competitive, and Colleges' curricula can support that.

Thomas Jefferson University students are moving beyond the current commercial and financial understanding of innovation as they go through an educational experience that requires break through ideas, approaching industry challenges with an experimental mind frame, as well as compelling insights and a focus on the human element with data written all over it. We have introduced four required Data Analytics courses for all business students regardless of their major. These courses also form Data Analytics Minor that could be taken by any undergraduate student. At the graduate level, an innovation MBA degree with a concentration in Data Analytics is offered.

Thomas Jefferson University Applied Analytics coursework provides students with the cutting-edge knowledge and skills to identify, understand, and deliver insights from large data sets and enable internal and external clients with organizational success and competitive advantages, as well as the skills needed to implement and oversee data-driven decisions, including collecting, managing and describing data sets; making inferences and predictions from data; and preparing optimal and robust decisions.

Data Analytics is a powerful and essential capability for companies and enterprises to be competitive. The quantity, quality, and diversity of available data continue to grow, creating new and significant opportunities for businesses to use data to improve their decisions with respect to both internal resources, as well as external relationships with suppliers and customers.

As a global pandemic has strained global resources in education, innovative approaches like affordable higher education, implementing innovative learning spaces (Mathews and Soistmann, 2016), as well as Data Analytics curricula could provide meaningful support to the teaching and research communities in academia to educate students and prepare them for the job in future. However, for Universities and Colleges, the biggest challenge in the on-line transition was to acknowledge that providing a digital platform during the pandemic, and still charging the same tuition for teaching the class that would be otherwise taught in-person, was simply not enough. Additionally, studio and laboratory teaching provided additional extraordinary obstacles. On-line learning necessitated a complete makeover of the teaching and delivery modes on one hand, and the use of sustainable computer architectures, on the other hand, to satisfy curricular activities as well as students learning objectives. The learning mechanisms for in-person classroom teaching had to be transformed. From the students' learning perspective, there was the need to transfer to students' knowledge acquisition relevant to a particular discipline. Then came the transformation of that knowledge into professional competence by solving case studies. Lastly, students needed to exchange ideas and to participate in discussions to satisfy class learning outcomes.

During the pandemic, in an on-line education, learning mechanisms could not be delivered through a single digital platform. They had to be taught through different tailored delivery modes. Knowledge acquisition and its transfer was realized through live, on-line sessions, using digital platforms such as Zoom, Microsoft Teams, WebEx, Slack, Google Hangouts. Exchanging ideas and participating in discussions was accomplished through semi-synchronous social platforms tools, accurately moderated by professors. That all had to be done to justify no tuition raises during the pandemic, and paved the way to affordable higher education schemes.

4. Affordable higher education – financing it all

What makes the cost of a college education feel right or even like a bargain versus overpriced is very much in the eyes of the beholder. In a study conducted by Sallie Mae families rated whether they thought the value of the education the student is receiving compared with the price was (Ipsos, 2020) using a five-point scale: an excellent value, worth every penny; somewhat of a bargain; appropriate for the education they received; somewhat overpriced; and significantly overpriced. In the pre-pandemic time (Academic Year 2018-19), the perceived value by average total cost seemed to be just right for low, medium, as well as high income families.

While families paid less for College education nationwide during the pandemic, they still reportedly (Ipsos, 2020, 2021, 2022) relied on the similar paying mechanisms as pre-pandemic. In particular, families reported paying $26,373 for college in the Academic Year 2020-21, that is, a 12% decrease from Academic Year 2019-20, and that corresponded to the costs reported during the pre-pandemic Academic Year 2018-19. Also, it was indicated that despite uncertainty and changes encountered by many families throughout the post pandemic Academic Year 2020-21, most covered the cost of education in ways similar to those used pre-pandemic.

Parent income and savings covered nearly half of College costs (45%). Funds earned from scholarships and grants covered 25% of the costs, while student borrowing covered 11%. In addition, parent borrowing covered 9%, while student income and savings covered 8% of the costs. The remaining 2% came from relatives and friends' funds.

For the few years in a row, starting during the pre-pandemic Academic Year 2018-19, 90% families with a student enrolled in college viewed college was an investment in the student's future, while 80% of families felt positive in terms of paying for higher education pursuits. That did not change significantly during the pandemic Academic Year 2019-20, as well as the post pandemic during the Academic Year 2020-21 (Ipsos, 2020, 2021, 2022).

5. Conclusions

As Universities and Colleges update their classrooms to enable active learning methodologies, adjust their financial aid models, Data Analytics curricula could provide meaningful support to the teaching and research communities in academia to affordably educate students and prepare them for the jobs of the future. Colleges must also build the technological infrastructure to house and converge the massive volume of academic data. Furthermore, they need to invest in the human capital, educating big data scientists and engineers, and computational intelligence experts to further guide us into the exciting frontiers of business and science.

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