Improving Students' Success in 21st Century Higher Education Through Data Analytics

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Abstract

Changes are constantly sweeping many higher education institutions across the globe. They are more rapid than was ever projected for the twenty first century higher education. These institutions are out of sync with the demands of the twenty first century economy. Consequently, current college graduates are facing very difficult times landing a meaningful entry level job within the workforce. The inability to find jobs makes them unable to have financial freedom following graduation. This trend is real and ongoing because the graduates are lacking basic job ready skills. The endless list of many problems that have been chronicled to be wrong with higher education include but are not limited to lack of accountability, the constant budget woes, the ever increasing declining trend in enrollment, retention, cost, and deficient basic job ready skills for graduates. Data analytics as a management tool as applied in industries holds promise in addressing many higher education issues. This study examined the spectrum of data analytics as a management tool in higher education: student success, equity and institutional performance, promotion of equity and generational involvement, projectory role of millennials and data analytics, and five projections for facilitated teaching and learning towards the future. Further, it addressed advantages of data analytics, getting the right data at the right time, data informed learning design and key changes in higher education for the future.

1. Introduction

The millennial generation is the nation's future in order to building a bridge for student success. The projection is that by 2040, the racial and ethnic minorities will makeup over half of all of the United States. Basically, this means that at least approximately 44 percent of this population will be the cornerstone for many generations to come. This means a transformational change that will impact institutions of higher learning. It can be expected that the millennial generations become more diverse, many will face obstacles as it relates teaching, learning, and student success. The millennial generation represent at least 75 million of America's baby boom generation. Previous research focused much on the millennial generation success with technology, however this is a thing of the past now and the trend has shifted. As a result of the transformational changes in higher education, institutions are having difficulty keeping up with the operations that continue to impact accountability, enrollment, retention, cost, and job ready skills for graduates [1]. Data analytics is at the center of focus for student success and involvement in higher education. There is an increased interest in higher education institutions to utilize data on their students to identify and measure academic success, retention and potential for graduation. Predictive analytics is the actual term that is gaining an enormous amount of attention. The role has changed for the institutions; it is around success of the student as a learner. Higher education institutions are compelled to review the graduation completion rate of all students. Educators have come to realize now that the role is more than learning, it is moving above and beyond the threshold of learning. The more institutions are able to gather data on students use and access, learning impacts how educators teach and learn. Having the accessibility of integrating data provides the appeal for educators to understand how students engage within the academic experiences that have been designed for them specifically relative to the chosen major or minor. Some of the key challenges being faced now consists of enrollment, budget, and retention. Many institutions are finding out that they are not able to meet the enrollment goals, less amount of students are graduating, and mainly the large budget cuts that have been reducing higher education institution goals globally. What does this mean for the future in higher education? How can we maintain the status quo and prepare students for the workforce? Some of the major concerns for students to consider coming to college is financial support. Higher education institutions are going to have to optimize closely and set goals that can be met successfully. Higher education has been late in adopting the management tool of data analytics for learning. Data analytics has been used for many years in the area of consumer behavior. There is much research that use the term data analytics and/or predictive analytics. For this research, the term data analytics is used. Data analytics for this study defines data as innovation and meaningful communication patterns in data by way of

assorted tools and techniques employed to provide a quantifiable number in the performance of students, make predictions and to use results to design strategies to improve academic success of students. This can be done in many ways. Higher education defines analytics as being the utilities or systems engaged on both sides of the coin for administrative and academics to improve student learning and performance. At this point, the professor is at the forefront and plays a major role as to the efficacy and management of student enrollment and budget justification [2]. The reasons for the role can be linked to the increase in institutional accreditation requirements, lack of funding, competition, assessment, state and federal regulations demands. These are some of the major contributing factors to the adoption of analytics in higher education. [1] suggested that higher education institutions have always gathered data on learning but the data is not being analyzed adequately and interpreted into useful data.

For many years, America's colleges and universities were regarded as voluminous as the best into the world. America is no longer considered to be the most highly educated nation in the world due to the above mentioned challenges and issues according to [3]. Many education leaders have turned their focus to shift towards sustainability, student success, educational reform, and educational technologies that motivate and facilitate learning integration into the classroom. According to [4] only about approximately twelve percent of presidents ranked implementation of research and evidence amongst the top five areas for growth towards the future. Administrators are being forced to leverage their continued existence and pressure as to how to best use the data for proper growth. As America's population continues to age and diversify, the job to leading a college or university has become problematic over the most recent years. The question to ask is, are we effectively preparing our graduates for jobs? Colleges and universities have had to put up with the scrutiny on their institutional performance and growth towards challenges of these financial times. [5] imply that this undermines the sustainability of the future existence of colleges and universities towards the future. Many colleges and universities use their data to plan for predictive analytics for the improvement of student outcome data. Regardless of the college and/or university's level, an effort must be made towards the investment and planning for the improvement of student outcomes, equity and digital resource strategies. It is important to note that many universities and colleges differ relative to their focus and data analytics efforts and how some of these areas can influence the other. [6] indicated the fact that many states have a set of goals for universities and colleges that must be completed within a specific timeframe in which those goals are connected to performance-based funding, degree completion, and job placement.

2. Equity and Institutional Performance

Higher Education Institutions are having to revamp their key efforts towards equitable access and outcomes towards students. This has become a necessity as the demographics within the United States shift and the sketch of today's students become more diverse in age, race, and ethnicity. It is important to note that the way in which these students engage in and navigate higher education differs tremendously from previous generations due to learning styles, responsibilities, and distinct experiences. In 2016, the Higher Education Data Warehousing Forum (HEDWF) provided challenges that institutions are facing regarding their use and implementation of data use. HEDWF, 2016 listed five issues facing institutions: data governance at 57%, student success at 47%, data quality at 45%, and predictive analytics at 35% respectively [7]. Developing a plan for smarter campuses that focus on student outcomes, equity, and resource strategies will increase and have the most impact within the academe infrastructure. The key to being successful at these efforts would be leadership, clear and smart goals, and most of all a willingness to change. College and university presidents face diverse demands, making it virtually impossible to have the time to develop a deeper universal understanding of data analytics and what the data mean. In contrast, presidents need someone to work close with them with the necessary resources, knowledge, and time to inform them of some of the most important areas that will make the most impact: 1) Student outcome improvement; 2) Promotion of Equity; and 3) Utilization of integrated academic/personnel, services, and budgetary data to improve productivity. Understanding the key elements of these areas will enable administrators to make informed decisions on improving institutional performance and most of all productivity.

3. Promoting Equity and Generational Involvement

Massive Open Online Courses (MOOCs) is one of the main energy driving the seismic transformations in the 21st century higher education arena. MOOCs has been able to move the academe to better review their processes for teaching and learning and best pedagogical practices [9]. The review has forced programs to consider teaching in ways that was never practiced before. This big idea led to a flipped classroom model that is challenging for faculty but led to students' success because of the active engagement involved. The use of open education resources (OER) also has kept up the momentum in higher education

changes for the twenty first century. Active teaching and learning have transformed student populations, faculty, and student roles. The current force demands higher education institutions to self reflect through a new lens with intent to provide needed hope, transformation, and improvements to the twenty first century higher education curricula. The shift in demographic data will continue to shape higher education reform strategically in the coming decades. While predictive analytics predicts students' success, available data suggest not only shifts in enrollment, but also in cultural diversity amongst all races. It also predicts, changes in student faculty interactions with the faculty serving in multiple roles such as: instructor, advisor, mentor, etc. thus, leading to a number of innovations in active teaching and learning process. The new trend requires the integration of disciplines, supplemental instruction, and peer led team teaching for engaging students. According to [9], demographical data suggest that by 2050 fifty-four percent of the United States population will be minorities. The U.S. is projected to become a majority-minority nation for the first time in 2043. This projection will have potential impact on enrollment figures of ethnic minority students. While these trends translate to student success, the twenty first century professoriate will be encapsulated by continued challenges such as graying faculty members, demand for new teaching and learning strategies that are effective for millennials.

4. Projectory Role of Millennials and Data Analytics

Millennials will continue to play a vital role towards a more diverse America. The millennial age progresses from 18-34 in 2015, to ages 28-44 in 2025, and to ages 38-54 in 2035 [9]. The millennials are larger than the baby boomers. As they progress towards age, they will become the center of the population. According to [10] between 2014 and 2060, the U.S. population has been projected to increase from 319 million to 417 million that will reach a projected high of 400 million by 2051. By 2044, more than half of all Americans will belong to a minority group and by 2060, nearly one in five of the nation's total population will be projected to be foreign born. In 2015, approximately about a half of the U.S. population were older millennials, and less than a quarter of Americans were younger. By 2035, less than a third of Americans will be older than millennials and 46 percent of the population will be their junior which includes baby boomers and the Generation Xers [10]. This will lead millennials to make their mark in education, politics, and business taking stock to higher levels. Based on all of these changes, age, race, and ethnicity will definitely have an impact on the role of data analytics in higher education. See Figure 1 Age and race-ethnic distributions of U.S. population.

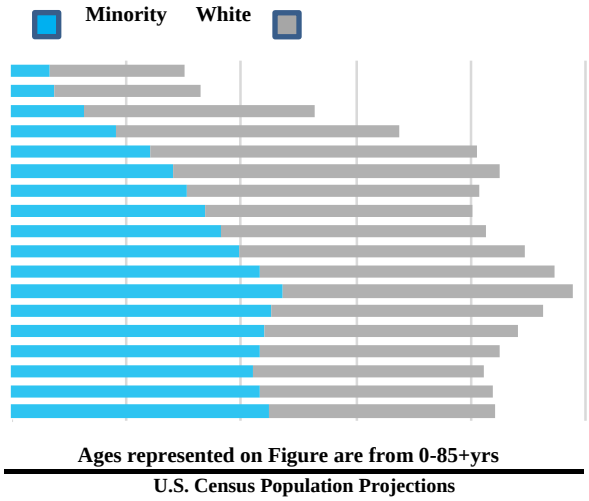

Figure 1. Millennial Projections Based on Age, Race, and Ethnicity by 2025

Millennials are already making big impressions on the nation. The imprint they will make will have a lasting legacy based on how they successfully serve as social, education, and political bridge to the next diverse generation. The offices such as institutional research and information technology should be provided the resources in order to lead the efforts to create and diffuse a culture in order to manage the growing data of millennial consumers and demands. There is no way around it, there are many twists and turns but by integrating the role of millennials on data analytics will promote equity that will lead towards improved student outcomes and create more holistic resource strategies. Moving beyond the present time, institutions will need to facilitate a successful process for teaching and learning as we move towards the future. A study was done by [11] which showed the role that today's students play as to the reluctancy in being passive learners. These millennials are not interested in listening to lectures, showing up for class, and taking exams, but however, what they want is to be engaged and become part of the learning process. They are pushing towards a fully immersive educational experience that will provide the transformation needed in institutions if they want to survive. The higher education institutions are faced with challenges and demands as to having the appropriate learning tools that allow them to learn anywhere, whenever, and using any platform beyond the classroom. Access is the key to change for future generations to come. Millenials will lead the change in how learning takes place and will be the driving force for the realm of innovative and facilitative learning tools. For higher education transformation to

continue to exist, there are five projections that will need to be considered as part of the force for learning.

1. Universal Design for Learning, Accessibility, and Instructional Design: this implies the role of different learner abilities and functional learning styles that impact the future of teaching and learning. The role of accessibility and universal design for learning is used in this article to refer to those with speech and language impairments, physical, sensory, cognitive, or learning disabilities. Accessibility places pressures on the digital platform for teaching and learning. Professors should be knowledgeable as to their role into knowing the principles of accessible design for learners. This can be done by providing an accessible course syllabus that encompasses techniques and strategies as to how students learn, integrate, and process information learned within the classroom. The key to success has to do with the impedance to success for all learners. All institutions are responsible for providing accessible educational materials. This can be done by setting up opportunities for multiple means of engagement, actions of expression, and embedded accessible multimedia content. Some examples of the Open Education Resources (OER) include: Open Professionals Education Network, Multimedia educational Resource for Learning and Online Teaching (MERLOT), The Open University, Creative Commons' Education Site, Openstax, and the National Center on Accessible Education Materials just to mention a few. Change is not only coming, it is here, and here to stay.

2. Academic Transformation: the pressure and competition from government, companies, and education will create the opportunities. Innovative transformation will consider taking advantage of the immersion of technology, state and university systems, forging partnerships with the public and private sector gearing towards a wider range of learners which yields towards diversity and equity of learners.

3. Faculty Development: there is a need for institutions to rethink the student and learning experience that leads to successful faculty development experience. Institutions should develop as part of their strategic plan a process for faculty to share their stories and experiences, reward faculty for their hard work, and most of all allow time for exploration towards the transformational changes that are impacting the teaching and learning process. More importantly, is success for all learners.

4. Digital Literacy/21st Century Learning: with the changes impacting our educational institutions we are moving towards a labor society to a knowledge-digital society. This paradigm shifts places value on the community at large rather than on just information. The interest is on the power of the networks and connections with people, places, and most of all their ideas. Studies have shown the necessity to integrate the three models of digital literacy which includes universal literacy, creative literacy, and literacy across discipline. This offers insights as to the learning of postgraduates specifically as to what is being learned, need to learned and most of all what does that mean towards infusing that learning within the workforce. Basically, this means a creation of lifelong learners that is essential to thriving and surviving in a lifelong career. As technology continues to evolve, the future of education and professions are expanding such as the integration of artificial intelligence, and robotics. It is imperative that higher education institutions understand and apply how digital literacy and skills for 21st century workers impact learners at work. In making predictions for the future and direction of jobs, there consists a set of work related skills that are needed such as complex problem solving, critical thinking, creativity, emotional intelligence, judgment and decision making [8]. Through the incorporation of these emerging technologies and the ever evolving workplace future demands, institutions in the future will better prepare students with the skills to meets the needs of perspective organizations.

5. Security and Privacy: all users at the institution whether faculty and/or student must have a conceptual understanding of a range from personal to privacy to what is public and what is used as informational. All users must take considerable responsibility as to how they use data, misuse data and the protection for the data as part of the teaching and learning process.

It is highly recommended that higher education focuses their attention on college freshman and learning engagement. According to [8] higher education is one of the fastest changing markets ever. College students enrolled in higher education are anticipated to be more than double to 262 million by 2025. This process can be categorized as how to identify the low to high risk student and have them to be part of the groups for retention consideration. Employers are telling students they want more than a college degree and transcript [8]. Employers are requiring students to be better prepared for the workforce. We are seeing a rise in expectations from both students and employers for more comprehensive credentialing that documents skills, abilities, and knowledge across the lifespan. Unfortunately, most universities have not come close to the bargaining table to meet the expectations for workforce ready. Students must be prepared and ready to meet specific employer needs. Students need to demonstrate their readiness to work within the workforce.

Additionally, higher education can plan for teaching teamwork, problem based learning, and case

study based approach for students entering the workforce. It is imperative that students learn how to work well with others, be creative, and think outside of the box. Higher education institutions will need to work harder and more competitively to prepare students to invoke their creativity, and innovation within the workforce [8]. Students will need to go above and beyond the role of using computers in knowing how to navigate the world of computing. Due to the compelling need to operationalize a paradigm shift in teaching and learning, the move has made faculty to take into consideration 21st century skills for students [12].

The skills students need, allows the teaching and learning to focus more on creativity, diversity, flexibility, motivation, critical thinking, and problem solving. Some of the future trendsetters are robotic instruction, artificial intelligence, and coding classes. 3-D printing is already common, but by 2030, printing a replacement for a broken part of your bathroom cabinet may be the norm. Possibly the need for truck drivers will be no more due to driverless car technology. Many computer jobs will be around from robots to artificial organ farmers-a person that grows new livers, kidneys and spleens like peanuts or roses in a garden. There will continue to be advancements in the 21st century such as e-learning. These e-learning environments can aid our higher education systems to customize the learning environment and personalize he realm of delivering audio/visual and graphical content in order to enhance and improve higher order thinking skills and abilities. By doing so, it prepares students for the mobile workforce. [8] indicated that the flipped classroom approach is challenging within the learning environment but the outcomes leads to improvements with the actual engagement of students and feedback in order to measure what works.

5. Conclusion

It is quite important for boards at the university level to understand the reasoning behind data analytics. Competition in higher education continues to be fierce and the continued efforts in running an institution is constantly challenging. Data analytics will assist universities with meeting the calls to legislators, government officials, accreditors, community and public at large about their management operational systems along with student learning outcomes. Data about student learning will definitely improve teaching and learning in ways that help students to achieve and yield better results. Lastly, the ultimate goal for all students is to be able to manage their lives and function as responsible members of a society. Data analytics holds great promise for helping colleges and universities make good decisions impacting student life cycle. Data analytics will continue to influence higher education. Future studies should assess the best and effective tools for determining student success, identify the types of things you would like to track and measure about students, and consider how to design a learning environment that is helpful in producing useful data. We can simply imagine a future where students are in control of the data and documenting the learning across a lifetime.

Data analytics is changing how learning takes place. It has become the driving force in the implementation and innovation of learning new tools, access to resources, and teaching and learning styles. This is proving to be a process whereby institutions have moved towards more of a learner centric environment that will guide students to become independent thinkers and directors of their own futures in years to come. It is proposed that a new nation of generation analytics will move beyond probabilities to personal projections and focus on the now and the future. Change and growth will continue with an emphasis on competition and leveraging relevancy to institutional strengths. Institutions must position themselves within the marketplace that will enable and attract more students and faculty. Institutions must shift away from the old model of doing what they have always done and then expect to get where they are projecting to be. Change is hard, and often human beings struggle with change, even when they know it will be positive. Most of all, the shift is to move towards a transformation that will adhere to institutional values and most of all that are driven by a mission that is reflective in societal changes, needs, demands, equity, and diversity.

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