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Bridging the Digital Divide: Using Ecological Modeling to Enhance Adult Student Recruitment and Retention in Higher Education

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**BRIDGING THE DIGITAL DIVIDE: USING ECOLOGICAL
MODELING TO ENHANCE ADULT STUDENT
RECRUITMENT AND RETENTION IN
HIGHER EDUCATION**

by

Katherine Dawson, B.A., M.A.

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

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be accepted in partial fulfillment of the requirements for the degree of

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ABSTRACT

Higher education is at a crossroads. An enrollment cliff (Kline, 2019) looms and global instability only exacerbates the need for higher and continuing education. The global COVID-19 pandemic of 2020 highlighted the problem, and despite the evolutions in technology and Internet connectivity, there is still a chasm regarding equity of digital access. This applied dissertation study examined the barriers that exist for returning adult students to higher education and the digital divide in Louisiana. The study focused on the potential adult student population of Louisiana who have some college experience but no bachelor's degree. Designed using archival research methods, the study uses maps for ecological modeling. The extent to which the digital divide impacts the potential adult student population of the state of Louisiana was explored through ecological models in the form of maps created using openly sourced government data (the ACS and the FCC Form 477). The theoretical considerations of population ecology and a theory about the digital divide, van Dijk's resources and appropriation theory were explored. As well as two conceptual frameworks, the Spatially Aware Technology Utilization Model (SATUM) and the Three Domains of Sustainability used to frame the interpretation that conclude that access, ability, and affordability are the three domains required for stability and use of the Internet. The results from the study found that both geographic location and socio-economic characteristics do seem to impact access to the Internet. The analysis includes recommendations for addressing barriers to adult student recruitment and

retention through the three components needed to create organizational stability:
environmental factors, social factors, and economic factors.

APPROVAL FOR SCHOLARLY DISSEMINATION

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DEDICATION

This dissertation is dedicated to all those adults that are struggling to complete their educational journey and all those who support the educational pursuits of adult students. Both the research and the process have been a grand lesson on resilience, tenacity, and humility. May we all find a way forward and share both our successes and struggles to improve the educational journey for others.

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CHAPTER 1

INTRODUCTION

Overview

Education is a change agent and has long served as a bridge to new opportunities for students who complete undergraduate college degrees. Earning a bachelor's degree empowers graduates to transform their economic and social situations. The Bureau of Labor Statistics (2020) reports that the more educated a laborer, the less likely she/he will be to experience unemployment and will likely earn more as compared to laborers who have less education. Specifically, laborers who have earned a bachelor's degree on average earned 41% more than laborers who have not earned a bachelor's degree (Torpey, 2021). College graduates also had a 3.5% less likelihood of experiencing unemployment as compared to their less educated-counterparts (Torpey, 2021). Despite the documented advantages bachelor's degree holders have in competing in the labor market, a large latent adult student population exists. To address a looming enrollment cliff, higher education administrators should be looking for opportunities to engage a large latent adult learner population to offset declining enrollment in the traditional 18-24-year-old student population.

Statement of the Problem

The problem investigated in this study was the impact the digital divide plays in exacerbating technological barriers for adult students living in Louisiana when re-enrolling and matriculating in higher education programs. As institutions entered the new millennium, higher education administrators watched enrollment numbers for the traditional college-aged student population, 18-24-year-olds, decline (Kline, 2019). That natural decline in enrollment due to lower numbers of populations of traditional college-aged students requires higher education administrators to engage and expand the audience for undergraduate degree programs to adults 25 years and older.

In the state of Louisiana, there are more than 665,000 Louisiana residents with some college experience but no bachelor's degree (U.S. Census Bureau, 2022). A collective goal has been set by the Louisiana Board of Regents to hit a higher education attainment goal of 60% of the state's working age population (25 - 64-year-olds) by the year 2030 (Board of Regents [BoR], 2019). As this aggressive goal was set, the directive to engage the large latent adult learner population provided an answer to the looming enrollment cliff that higher education is expecting to impact campuses heading into the next decade (Kline, 2019).

Expansion of the undergraduate student audience has to be supported throughout the institution and have strong leadership, multi-supported implementation, and buy-in from the campus community. Adult students typically have more competing priorities than typical 18-24-year-old students. Serving adult students requires identifying barriers to their re-entry and retention and making changes to policies, processes, curriculum, degree programs, learning modalities, and potentially even the pedagogy/andragogy

within course instruction. Many higher education institutions that make that shift in culture on a campus to serve adult students have to continue to evaluate and re-evaluate the ways that their institutions are combatting barriers that make re-enrolling and matriculating difficult for adult students.

Barriers to re-entry and matriculation typically fall within categories: dispositional barriers, situational barriers, institutional barriers, and technological barriers. Dispositional barriers are barriers that relate to the student's confidence in their abilities as a learner. Situational barriers are barriers that relate to life's natural highs and lows. Institutional barriers are the obstacles that higher education institutions create and/or perpetuate, often seen in policy and/or processes. Technological barriers directly relate to the phenomena of the digital divide, specifically is Internet connection available to the student and if it is, will the student be savvy enough to navigate the Internet to complete course work.

Purpose of the Study

The purpose of this applied dissertation study was to discover and address barriers to re-entry and persistence that adult students experience. Specifically, the study focused on identifying and understanding the technological barriers and role that the digital divide plays in perpetuating barriers for adults with some college experience but no bachelor's degree living in Louisiana.

Research Questions

R1: Based on United States Census and Federal Communication Commission (FCC) data, what connectivity and geosocial factors (providers, location

proximity) impact adults residing in Louisiana who have some college but no bachelor's degrees?

R2: Based on United States Census data, what socio-economic factors (unemployment, income, dependents) impact adults residing in Louisiana who have some college but no bachelor's degrees?

R3: How does this information inform higher education administration strategic planning in the recruitment and retention of adults living in Louisiana with some college but no bachelor's degrees?

Theoretical and Conceptual Frameworks

This study was designed through the theoretical ecological organizational lens of population ecology. This ecological organizational theory can be used in both theoretical and empirical studies and supports growth and sustainability within organizations (Salimath & Jones, 2011). Population ecology posits that changes occur as a result of the process of organizational selection and replacement, impacting populations through those changes (Carroll & Hannan, 1989). Organizational chances of survival are based on the savviness of organizations to form and grow in environments that will support and sustain them through periods of change. Population ecology emphasizes that change is constant in organizations and explores the idea of 'inertia' (Hannan & Freeman, 1984; Salimath & Jones, 2011). Inertia is the internal force that can either help orchestrate change or the combined forces that prevent change within an organization. Both elements (forces of change and forces of resistance) can exist at the same time within an organization.

The existence of a digital divide (those with access to Internet/technology versus those without access) is not a new concept. Rachfal (2021) describes the digital divide as a term “used to characterize a gap between Americans who have access to telecommunications and information and those who do not” (p. 2). Theories about the digital divide were explored to help inform the analysis of the archival ecological modeling study. The theory and concept explored were: van Dijk’s theory, resources and appropriation theory, and the Spatially Aware Technology Utilization Model (SATUM).

Van Dijk’s theory, resources and appropriation theory, posits that socio-economic characteristics affect a person’s ability to access the Internet or appropriate hardware to use the Internet (Pick & Sarkar, 2016; van Dijk, 2017). Socio-economic characteristics include but are not limited to income, occupation, place of residence, educational attainment, and ethnicity. Socio-economic conditions may significantly impact access to the Internet (a paid service) and a person’s ability to use the Internet. This theory was an important concept to explore through the analysis of the ecological models because it provides a visual depiction of unmet or unknown needs. This information has the ability to help higher education administrators evaluate policies, procedures, curriculum, student engagement, recruitment, and retention practices.

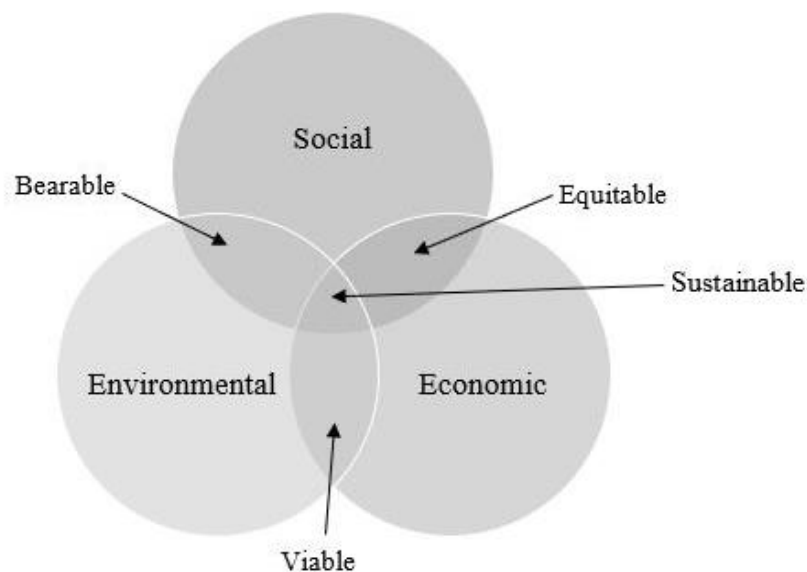
Additionally, pairing van Dijk’s theory, resources and appropriation theory, with the SATUM model was important to determine if socio-economic characteristics and/or geography play a role in exacerbating the digital divide for Louisiana residents with some college credit, but have not earned bachelor’s degree. SATUM posits that just as economic and social characteristics play a role in access to and the ability to use technology, geographic location and availability of technology resources are equally

important (Pick & Sarkar, 2016; van Dijk, 2017). This model addresses geographic barriers to Internet and technology access.

Ecological modeling has several varieties for analysis, but the modeling for this study focused on the conceptual framework of the Three Domains of Sustainability (Figure 1-1) sometimes also known as the Three Pillars of Sustainability (Park & Lek, 2015; The University of Nottingham, 2022). This type of forecasting includes analyzing information on environmental factors, social factors, and economic factors to find ways that the three areas will be equally supported, thus creating sustainability (Park & Lek, 2015).

Figure 1-1

The Three Domains of Sustainability



Note. Social, environmental, and economic characteristics are the three domains of sustainability. However, the intersection of each characteristic leads to an assessment of the condition that the characteristics can exist. The intersections of the three characteristics create sustainability. Sustainability are the conditions in which the three characteristics will continue working in harmony/equal measure (Park & Lek, 2015; The University of Nottingham, 2022)).

The Three Domains of Sustainability give a context to frame the barriers that make re-entry and retention a challenge for adult students as well as a direction on where to begin dismantling and addressing these characteristics.

Research Design

This study used an archival research method design. Archival research methods typically fall within three categories: history, archival, and ecological (Ventresca & Mohr, 2002). Archival research methods are methods that “facilitate the investigation of documents and textual materials produced by and about organizations” (Ventresca & Mohr, 2002, p. 2). Additionally, archival research methods can be used by scholars who are investigating non-historic materials (digital texts, electronic data bases, webpages, etc.) created and used by modern organizations as a tool/tools to enhance other research strategies (Ventresca & Mohr, 2002).

Ecological archival research studies that focus on relationships between variables begins by looking at a wider scope of resources and then becomes narrower as the study progresses reflecting the first component of the study “few vs many” (Ventresca & Mohr, 2002, p.15). This study considers a wide variety of resources as research progressed. The decision was made to focus on visualizations to model the existence of the digital divide using open-access, government-collected data. Ecological studies may reflect a traditional qualitative approach to using the resources from the American Community Survey [ACS] 2019 5-year estimates collected by the U.S. Census Bureau for this study through the use of coding (U.S. Census Bureau, 2022; Ventresca & Mohr, 2002). Coding allows the researcher to organize the themes of the data and requires the researcher to

draw her/his own conclusions about the information gleaned from the research. The inference or pattern of emerged relationships requires the researcher to apply meaning.

The second set of analytic distinctions to determine if the approach to research is “descending vs. ascending” (Ventresca & Mohr, 2002, p. 16). This means that the researcher uses the resources to connect the implicit theory of causality that the researcher applies to the study. A descending approach was taken for this applied study. The final set of analytic distinctions for archival research are between “object vs. relationship” and is in the intent of the researcher’s focus (Ventresca & Mohr, 2002, p. 17). This study falls in-line with other ecological researchers who look for relationships between their research subjects.

Data used to create the ecological models were open-source government data from the United States Census Bureau’s ACS 2019 5-year estimates and the FCC Form 477. Both data sources are open to any Internet user to download. A Geographic Information System (GIS), ArcGIS, was identified as a system built to interpret both geographic information and demographic information. The downloaded data were then uploaded to the ArcGIS software system. This system is designed to depict data geographically, showing variables from the ACS visualized on a map. These models demonstrate the descending approach to understanding the digital divide in Louisiana. The models were created to show the relationship of socio-economic factors as well as geographic location and the implications of those factors on Louisiana residents’ access to the Internet. They provide a tool that can now be used by higher education administrators to make better informed decisions about tools, resources, and services to serve the large latent adult population of Louisiana.

Significance of Study

This study is significant because it depicts and expands on what is known and understood about the extent of the digital divide in Louisiana. As the world was upended in March of 2020, higher education administrators in Louisiana learned how prevalent the digital divide was in the state. As the academy scrambled to transition to online remote learning, it had to confront the digital divide head-on in the areas of Internet availability and technology accessibility. Faculty who were not accustomed to teaching online struggled to adapt to the online transition, and courses were triaged. Students who had never taken online courses were thrust into them and expected to succeed digitally. There were limited tools available to understand the extent of access to the Internet. Administrators had to rely on those who were in need reaching out for help, and this led to uncertainty about access and understanding who was without access to the Internet.

Assumptions

Assumptions can be made about the role of the digital divide in exacerbating barriers to re-entry and persistence for adult students returning to finish a bachelor's degree. The comparison of the ACS 5-year estimates from 2019 to 2020 show an increase in the number of Louisiana residents with some college but no bachelor's degree by over 11,000 students in one year (U.S. Census Bureau, 2022). It is safe to assume that Louisiana residents who have some college experience but no bachelor's degree face any number of barriers to re-entry and persistence towards degree. Understanding that adults have competing priorities, several assumptions can be inferred about the targeted population: adults with some college but no bachelor's degree. Lacking an undergraduate credential can make finding lucrative job/career opportunities harder. An assumption

about the adult student population is that they may have more financial hardships than a traditionally aged student who may have more financial support options (Aslanian & Fischer, 2022). It can also be assumed that adult students are likely juggling more responsibilities or at least managing responsibilities to a greater extent than traditionally aged 18-24-year-old students. Adults are more likely to be in caregiving roles within their families, employed full-time, and perhaps even serving/leading within their community (Aslanian & Fischer, 2022; Fogarty & Pete, 2004). Adults who have already stopped-out of college will have less hesitation and are more likely to find it easier to stop-out again (Aslanian & Fischer, 2022; Fogarty & Pete, 2004).

It is a safe assumption that adults returning to finish a bachelor's degree will have to prioritize other life responsibilities over being a student and may step-in and step-out of their degree programs. Understanding those pressures, adult students will need educational pathways that allow adults them to enter, exit, and re-enter easily. The educational pathway that offer the most flexibility are programs offered fully online. Educators assume that to be successful in online programs, students must have access and the ability to navigate the Internet with savvy.

Scope, Delimitation, and Limitations

The scope of the study was the state of Louisiana's potential latent adult learner population. Data from the ACS 2019 5-Year Estimates (U.S. Census Bureau, 2022) and the FCC's Form 477 were used to depict variables around Internet access, types of access, and technology used to access the Internet. The researcher purposefully delimited the ecological modeling to one state. The study was additionally delimited to focus on a specific student type: Louisiana residents with some college experience but no earned

bachelor's degree. The researcher delimited the data selected to narrow to the potential adult student group information from the ACS, an annual survey conducted by the United States Census Bureau. The variables available to explore are thus limited to what information was included on the ACS. The researcher chose this data source for the consistency of data collection, formatting, and consistency of collection. Variables from the ACS were delimited from the analysis based on unit measurements. The ACS data was delimited to the most recent census data available at the start of the study and was limited because the data set available at the time of the start of the study was the ACS 5-year Estimates for 2019, since that time the 2020 ACS 5-year estimates have been released.

Limitations of this study include the ability to draw conclusions about specific student situations and individual populations within the latent adult learner population. Research focused on the whole population versus individual experience. The results of the study provided opportunity to draw some generalized conclusions about the latent adult learner population in Louisiana and those conclusions may or may not be applicable to latent adult student populations in other states/regions/countries.

Definitions

Action Research: a research method created to evaluate, investigate, or analyze an existing problem or weakness in an organizational, academic, or instructional manner with the goal to make research repeatable, realistic, and straightforward to enhance learning, evaluation, and/or improvements leading to better education for students, schools, teachers, and programs (Great Schools Partnership, 2015).

Adult Student/Adult Learner (AL): a student who is 25 years of age or older (Knowles, 1973).

Barriers to Online Learning: barriers to online learning are obstacles (internal or external) that prevent students from successfully matriculating in degree programs that are offered online.

Census Tract: a small, relatively permanent measure of population used by the ACS to group sets of zip codes close in proximity providing statistical subdivisions of a county/parish that can be updated by local participants.

Course Design: course design refers to the design, organization, and presentation of course materials in the learning management system (The QM Rubric, 2016).

Digital Divide: the gap that exists between those that have access and knowledge of the Internet, computer hardware and software and those that do not have ready access to the Internet and may or may not have experience operating computer technology and/or software (Cullen, 2001).

Digital Literacy: the ability for someone to use digital technologies with familiarity to search for information, communicate, and problem-solve. Additionally, literacy involves understanding how to “retrieve, assess, store, produce, present, and exchange information” (p.1) as well as communicate over the Internet (UNESCO, 2022).

Digital Native: a person who grew up with technology and was therefore familiar with the Internet and computers from a young age (Prensky, 2001).

Enrollment Cliff: a phenomenon predicted in higher education that tracks the rate of births in the United States and compares the rates of birth to the present population as it stands now (Kline, 2019).

Latent Adult Student Population: the potential adult student population that exists but has yet to be developed or in this case has yet to finish a bachelor's degree.

Learning Management System (LMS): a learning management system (LMS) can best be described as virtual classrooms that have the capabilities to house means of communication (chats, discussion boards, messaging, video conferencing), essential course resources (syllabi, pdfs, PowerPoints, written instructions, a gradebook), assignments (electronic quizzes/exams, discussion boards, drop boxes), and lecture materials (websites, videos, virtual labs, text related software programs) (Merrill, 2003).

Melt: a term used by higher education administrators to describe the lag to stalling of a percentage of enrollments, most commonly used to describe the enrollment period between spring and fall terms (Sanchez, 2021).

Online Program: an academic degree program that is taught fully online through an institution's learning management system. Students in online programs are never required to come to be on campus.

Undergraduate Degree: a bachelor's degree or associate's degree.

CHAPTER 2

LITERATURE REVIEW

Introduction

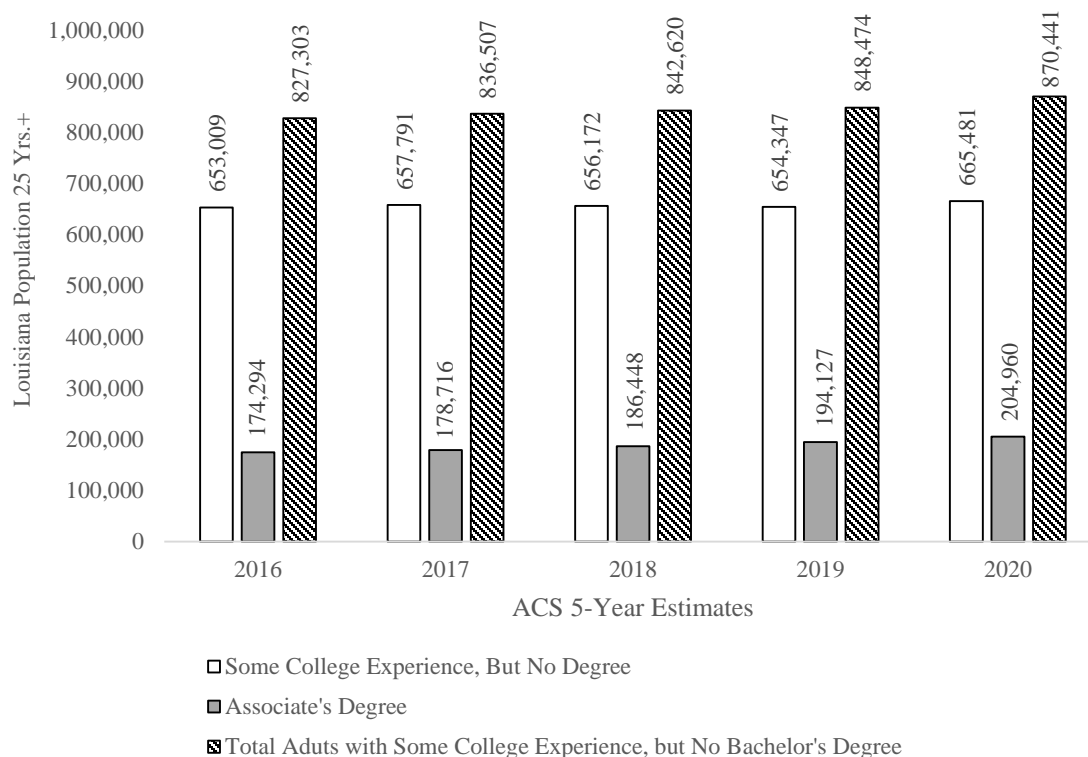
Upward social and economic mobility has long been tied to the achievement of earning a bachelor's degree (Chetty, et al., 2017; Ma, et al., 2020). The difference between the average earnings for adults who completed a bachelor's degree program and adults with only a high school diploma rose by 24 percent from 1991 to 2017 (Dawson, et al., 2021; Saum, 2019). High educational attainment results in stronger economies and less unemployment (Xu & Xu, 2019). The gains in the labor market fuel competitive global markets when paired with advancing technologies the ability for upward social mobility diminishes without a bachelor's degree (Xu & Xu, 2019). Therefore, educational attainment is both important to individuals and to the greater economic community.

Adult learners, a distinction given to students who are 25 years of age or older (Fogarty & Pete, 2004; Knowles, 1973), are quickly surpassing the traditional age (18-24-year-old) student market. The United States Bureau of Labor Statistics (2020) shows a steady and dramatic increase in the number of adult students who are returning to higher education. The growth in adult student enrollment has increased more than 71% from 1990 to 2020 (Torpey, 2020). Additionally, almost 58 million Americans have some college experience (or an associate's degree), but no bachelor's degree (Torpey, 2020).

Of the 58 million Americans who have some college experience (or an associate's degree), 870,441 of the adults in this group live in Louisiana (U.S. Census Bureau, 2022). This is a significant increase in the number of adult student stop-outs/step-outs in a five-year timespan (2016 – 2020). The chart below shows the population of Louisiana residents with some college experience but no bachelor's degree. Data reflects Louisiana residents with some college, no credential; Louisiana residents with an earned Associate's degree but no bachelor's degree; and the total number of Louisiana residents who have some college experience but no bachelor's degree (Figure 2-1).

Figure 2-1

Louisiana Adults with Some College Experience but No Bachelor's Degree



Enticing adults back to higher education is a challenge. Adult students are typically juggling multiple roles and responsibilities. These students are often raising

families, caring for loved ones, working full-time, and balancing community responsibilities. Adult students prefer online education for its adaptability into their lives. Adult students may experience disruption to their routines by adding a course load to their other responsibilities, but by selecting to complete their course work online, the disruption is minimized (Stoltz-Loike, 2017). Online education is a growing segment of higher education (Aslanian & Fischer, 2022). Xu and Xu (2019) highlighted that the rate of enrollment growth for online programs was steadily surpassing the rate of enrollment growth in face-to-face programs. This certainly seems prophetic given the mass shift to remote online education that occurred with the COVID-19 pandemic. Online education is considered an attractive option for adult students for several reasons, most notably for its flexibility for the learner and instructor, and its cost effectiveness (Stoltz-Loike, 2017).

Colleges and universities need to ensure that policies and processes as well as courses and programs are designed to enhance adult learner success. The adult student population has different needs and challenges than the traditional college student population (Deggs, 2011; Fogarty & Pete, 2004; Knowles, 1973). This literature review will explore online learning, adult learners, and barriers to success that adults face when returning to college in an online program with a focus on ecological organization theoretical frameworks. Four studies will be explored for their insights in the area of adult learner experiences in an online course setting. This information will help guide the research questions regarding adult student recruitment and retention for online programs.

Theoretical and Conceptual Framework Considerations

Several theoretical frameworks were considered as a lens for the study. One lens that was considered was the use of a critical theory. Critical theories seek to critique

existing thought and explore perspectives and experiences that may differ from the dominant group, thought, or pattern (Mezirow, 1981). Critical theories are important because they question the status quo and explain differences (Mezirow, 1981). Critical theories offer a shared interpretation of a group that differs from the predominant interpretation that may not reflect the societal norm (Mezirow, 1981). Relating to critical theories, adult learners in higher education are the societal other. After exploring several critical theories (including but not limited to feminism, queer theory, and Afrocentrism), it was clear that those four theories may be appropriate to describe the individual experiences of adult students, but not necessarily to answer questions about the population as a whole. Stepping away from theories that were more appropriate for individual experience led this research project to organizational theories as well as theories about the existence of a digital divide.

Organizational Theory: Population Ecology

Population ecology has been a popular organizational theory since the 1970s (Salimath & Jones, 2011). It is used in both theoretical and empirical studies and is linked to supporting growth and sustainability within organizations (Salimath & Jones, 2011). Population ecology postulates that changes occur as a result of the process of organizational selection and replacement and thus impacts populations through changes (Carroll & Hannan, 1989). Therefore, an individual organization's chances of survival are based on the collective overall savviness of organizations to form and grow in environments that will support and sustain them through periods of change.

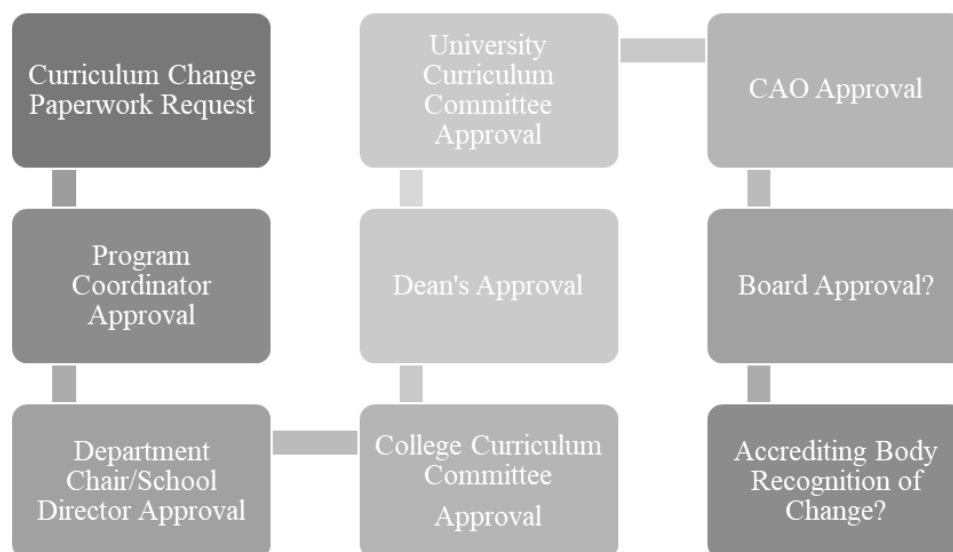
A basic principle of population ecology is that change is constant and occurs as organization's are created and dismantled (Salimath & Jones, 2011). Change does not

have to be as grand as inception and demolition of organizations; it can be smaller or larger adjustments over time. However, changes that are not beneficial to the population the organization serves may be detrimental to the survival of the organization (Salimath & Jones, 2011). Hannan and Freeman (1984) discuss a second basic principle of population ecology, the idea of inertia. Inertia is created at the organizational level when the organization is associated with having high levels of reliability and accountability for its' population. That kind of predictability creates a standard and culpability creates standard routine and the ability for reproduction. Implementation of those standard routines feeds the sustainability of the organization and thus creates the inertia to move forward. Inertia can act as both a catalyst for positive change and a catalyst for sticking with outdated and potentially ineffective organizational practices, policies, or processes. Change and inertia can both be present within an organization at the same time and even in the same areas. Parts of an organization may operate with more flexibility than other parts of an organization (Hannan & Freeman, 1984).

Hannan and Freeman (1984) demonstrated the concept of inertia through the example of changing curriculum components. The example demonstrates that curriculums are ever changing (new faculty, new course preps, new lectures, new assessments, new textbooks and other resources), however, the structure of the curriculum is rigid (degree programs requirements, general education requirements, GPA requirements) and can be difficult and cumbersome to change. To make a change to a university's curriculum starts with paperwork and Figure 2-2 highlights how complicated this on-going process may be. The figure is a generic flow-chart of curriculum changes.

Figure 2-2

Example of the Various Channels Curriculum Changes May Travel Through for Approval



Note. The above flow chart depicts a decision tree regarding curriculum changes. It is included to provide an example that demonstrates the many layers within the organization that must approve a change to curriculum and was a named multi-layer process described by Hannan and Freeman (1984).

The example shows that paperwork may start with paperwork submitted to a supervisor. Dependent on a supervisor as well as who is initiating the paperwork (an administrator or faculty member) may dictate how many administrative levels may have to approve that change before the paperwork is eventually run through a series of curriculum committees. As shown in Figure 2-2, if a faculty member proposes a change, it may have to travel through a program coordinator, to a department chair, to a dean. Once the paperwork is submitted, the various levels of curriculum committees debate the proposed changes – departmental, college, and university levels. Assuming the proposal is accepted/passed through committee, it still has to be signed by the chief academic officer. Depending on the type of change requested through the paperwork and the type of university or institution, the changes may have to additionally be approved by a

governing board. Those changes may at best take a few months and, at worst, years if at all. Changes to curriculum are much more astringent because they are at the heart of the identity of a university (Hannan & Freeman, 1984).

Changes to an organization's core values (like a university's curriculum) may affect the population an organization is serving (Hannan & Freeman, 1984). If the change is incongruent with the population's expectations or needs and is interpreted as a negative change, it can have a negative influence on the reliability and predictability of the organization to thrive or survive (Hannan & Freeman, 1984). Population ecology serves as a lens to examine the population or audience for higher education in Louisiana and the analysis of the response to that particular population's needs. The theory will guide recommendations for leadership overcoming barriers to entry and persistence in higher education in Louisiana.

Digital Divide Theoretical Considerations

The concept of barriers to re-entry and persistence are discussed later in this chapter, but that research affected the consideration for appropriate theoretical lenses. One of the areas identified as a barrier or potential barrier for adult students was the area of technology, especially as it relates to access (to Internet, software programs, and the hardware) and ability (to use the Internet, software programs, and/or the hardware) (Deggs, 2011). The existence of a digital divide (those with access to Internet/technology versus those without access) is not a new concept (van Dijk, 2017). Rachfal (2021), describes the digital divide as a term "used to characterize a gap between Americans who have access to telecommunications and information and those who do not" (p. 2).

Additionally, Rachfal (2021), goes on to describe that one subset of the digital divide issue involves access to high-speed Internet, most commonly called broadband Internet. Broadband Internet can be provided by a number of providers through a number of ways including digital subscriber lines (DSL), cable, satellite, fiber, telephone wire, mobile data plans, and fixed wireless (Rachfal, 2021). However, despite the numerous providers available and means for accessing broadband Internet, the infrastructure for those resources are still scarce to non-existent, especially in rural areas (Rachfal, 2021).

Van Dijk's Resources and Appropriation Theory

Jan A.G.M. van Dijk's theory of the digital divide, resources and appropriation theory, was developed over a ten-year period (Pick & Sarkar, 2016). Van Dijk's resources and appropriation theory posits that socio-economic characteristics play a role in a person's ability to have access to the Internet or appropriate hardware to use the Internet (Pick & Sarkar, 2016, van Dijk, 2017). This theory addresses characteristics that impact and describe the adult student population in Louisiana. The theory points to five core arguments: (1) an unequal distribution of resources is due to the categorical inequalities that exist in society; (2) unequal distribution of resources cause unequal access to technology; (3) characteristics of the technologies may also impact the inequities of access; (4) participation in society is inequitable because access to technology is inequitable; and (5) categorical inequities and unequal distribution of resources reinforce unequal involvement in society (van Dijk, 2017). As stated in the introduction, a bachelor's degree is linked with better economic opportunities throughout the life of the earner, so it is important to understand if perspective adult students who are currently living at or under the poverty line have the access to Internet and hardware to

use the Internet. Recruiting a student who lacks access to broadband Internet or the hardware necessary to be successful in their academic programs, let alone online programs, may not position a student to persist.

Spatially Aware Technology Utilization Model (SATUM)

Spatially Aware Technology Utilization Model, or SATUM, is a conceptual framework that addresses the digital divide. It posits that just as economic and social characteristics play a role in access to and the ability to use technology, geographic location and availability of technology resources are equally important (Pick & Sarkar, 2016). This theory addresses geographic barriers to Internet and technology access. This study uses this theoretical lens to focus on the role of geography in the ability for current and potential adult students to access a broadband Internet resource (Pick & Sarkar, 2016).

Learning Online

The Internet emerged as a wider-spread technology in the early 1990s (Rachfal, 2021). Around the same time, higher education turned to it as a modality for learning. Early online education programs were mostly used in business and some higher education institutions specifically targeted to an adult student population (Thompson, 2021). In 1993, Jones International University opened as the first fully web-based accredited institution. Throughout the mid-1990s other established and newly established higher education institutions begin to build and offer online courses. In 1998, California Virtual University opened. This consortium of California colleges offered around 700 online courses (Thompson, 2021).

As Internet resources expand resources and access to hardware expand on campuses as well as access to hardware (computer labs, laptop rentals, etc.), learning online becomes a more attractive option for traditional students in addition to in-person offerings (Thompson, 2021). As online programs continued to expand, so did opportunities for adult students. Online courses offered flexibility that in-person courses did not. Course work that could be completed asynchronously (on a student's own schedule) provided flexibility that the typical MWF (Monday/Wednesday/Friday) or TR (Tuesday/Thursday) course schedules requiring physical on-campus attendance. Course work in the early days of the Internet could be shared through electronic mail (email), but a stronger infrastructure for course delivery was needed if colleges and universities were going to be able to offer fully online courses and degree programs.

Learning Management Systems

Several learning management system (LMS) platforms exist to teach online courses. A learning management system can be best described as virtual classrooms that have the capabilities to house means of communication (chats, discussion boards, messaging, video conferencing), essential course resources (syllabi, pdfs, PowerPoints, written instructions, a gradebook), assignments (electronic quizzes/exams, discussion boards, drop boxes), and lecture materials (websites, videos, virtual labs, text related software programs) (Merrill, 2003). The LMS is organized by course, and each course has its own webpage interface with course-specific resources and tools available. Students have an individual username and password to login and are only shown the courses in which they are enrolled. Research has shown that the number of logins per student can influence student success with the LMS platform used for the course (Malm

& DeFranco, 2012). The more often a student accesses a course and interacts with its' components, the higher the likelihood the student will succeed in the course (Malm & DeFranco, 2012).

Online Course Design

Courses taught fully online can be composed of very diverse students and faculty without creating the sense of “otherness” which supports the description discussed by Luyt (2013). The composition of the students in the course can vary in age, socioeconomic background, ethnicity, culture, and experience with online education (Luyt, 2013). Luyt (2013) highlights the concept of understanding the variety of student experiences is important to consider as instructors and instructional-designers create the online classrooms.

The general popular assumption has been that with the ability to access the course using multiple pieces of technology (desktop computers, laptops, tablets, smart phones) and various options for Internet connectivity (cable, Digital Subscriber Line (DSL), Wi-Fi, Long Term Evolution (LTE), cellular data), students and instructors can connect from almost anywhere (Luyt, 2013). The 2020 COVID-19 pandemic revealed this assumption as being inaccurate (Aslanian & Fischer, 2022). This study examines the ramifications of that revelation.

Adults have varying experience with technology and the Internet, therefore comfort with technology may not be as high among adult learners as it is among traditionally aged students (Mosher et al., 2011). It is important that as a course is designed, the basic elements of the course are made clear and easily accessible so that even if the student is not a digital native, they are able to easily find the information they

need to succeed in the course (Elias, 2010). Comfort with technology will play a role in the level of self-efficacy that adult students may have while completing online courses, and thus technology plays a role in adult student persistence. In addition to confidence, access to hardware, software, and Internet connectivity is a factor or predictor of student success (Warden et al., 2022).

Online courses should be designed with Americans with Disabilities Act of 1990 (ADA) accessibility requirements in mind. Courses should have a certain amount of flexibility built into the design in regard to the amount of time given to students to review course materials and complete assignments. Course assignments and grade design should allow for students to have room for error without a large penalty (missing a small assignment or receiving a low score on a quiz should not mean a student is going to fail). The course should require elements of collaboration and interaction between students and with the instructor (Elias, 2010).

Learning Outcomes

Course design should focus on student learning outcomes. Whereas a traditional face-to-face course might focus on lectures and note taking to have the students comprehend learning outcomes, online courses require the creator's ability to give learning objectives first, and a means to meet those objectives second (Mosher et al., 2011). The difference between the two delivery styles points to different education models. The traditional lecture and note taking styles are Eurocentric in nature. The interdependence of stated learning objectives and resources are examples of the interdependence of the components to lend to student understanding. Assumptions should not be made about the level of comfort with digital navigation relating to this

interdependence of components (Warden et al., 2022). Course design is an important component of digital navigation. Students who struggle with digital literacy may find learning online more challenging than more savvy students. Access to the Internet and technology used to access the Internet are important pieces of information for faculty to consider when designing courses.

Adult Learners

Malcolm Knowles is considered the premier researcher in regard to information that is known about adult learners (Fogarty & Pete, 2004). Knowles (1973) found nine characteristics that a majority of adults exhibit in the classroom (both in a face-to-face environment and now in an online environment). The first is that adults want to control their learning, they want to be active in the decisions of what they are studying, how they are studying, and when they are studying. Second, adults need to understand and see that there is a reason to learn about a given subject. It is helpful if the information they are learning relates to a real-world scenario. Third, adults will learn best when the information being presented is based in an area that the student is passionate about or sees importance in learning. Research supports that adult students learn best when they are able to connect course concepts with their real-world experiences (Fogarty & Pete, 2004; Jones, 2013; Knowles, 1973; Mosher et al., 2011; Tsai, 2012). Fourth, seeing progress is important to adult students, and thus they need to be able to test themselves on their knowledge as they progress. Fifth, adults have a predetermined understanding of how the information they are learning will be used. Instruction and learning are purposeful, and adults can immediately put that knowledge to use. Sixth, adults will strive to improve within their course work and will expect to see evidence of this

improvement. Timely feedback gives students a clear understanding of where they stand in the course as well as a clear idea of their level of understanding of course material. Seventh, adult students understand the value of money and expect to be given the resources and services to help them succeed (Fogarty & Pete, 2004; Knowles, 1973). Eighth, adult students expect to be treated with respect by their peers and their instructors. They specifically seek out experiences that will be collaborative and that make learning comfortable. It is important that as adult students experience issues with uncertainty, that they be able to reach out to their instructor or peers and feel comfortable in expressing their uncertainty or questions. Finally, the ninth characteristic shared by adult learners is the reliance on the instructor to pace the dissemination of course information and materials in an appropriate timeline (Fogarty & Pete, 2004; Knowles, 1973).

Additionally, researchers have found that adult students have a strong sense of self (Fogarty & Pete, 2004). Adults who make the decision to return or start a degree know what they want. They have spent time finding themselves and have very specific goals and this can speak to their individual motivations for furthering their education. Zemke and Zemke (1995) point out that there is a “window of opportunity” (p. 32) that exists for adults to not only maintain an interest in learning, but also to retain the information that is being taught to them. Adults also may seek out opportunities to learn as a coping mechanism to major events occurring in their lives: personal, professional, or otherwise (Fogarty & Pete, 2004; Zemke & Zemke, 1995).

Barriers to Adult Learner Success

Adults who are in fully online degree programs have about a 10% lower retention rate than traditional face-to-face degree programs (Fetzner, 2013). This can be attributed to any number of reasons that may interfere with an adult student participating and completing online course work. Barriers to adult learner success (success as defined as completing and passing a course) fall into a few broad categories: dispositional barriers; life responsibilities; and academic barriers (Deggs, 2011). As mentioned previously, technical barriers may exist to a greater extent for adult learners as well (Elias, 2010). Compounding the existence of technical barriers is the psychological and cognitive barrier that, as technology continues to change, the learning curve for the adult student population increases (Wang et al., 2003).

Dispositional Barriers

These barriers are directly related to the tenants of self-efficacy theory. They are issues with confidence, ability, and drive to complete work in the online setting (Deggs, 2011). Because of this, adult students struggle intra-personally with their ability to learn course material and/or complete it (Deggs, 2011). If the course design of the online course is complicated and strenuous to use, students may have a hard time adjusting to the expectations set forth, mostly because they do not understand the expectations (Deggs, 2011). Frustration with technology or design can lead to self-doubt in abilities to learn among adult students (Fetzner, 2013).

Situational Barriers

Responsibilities in the adult student's personal life can also create barriers that most traditional students do not have (Fogarty & Pete, 2004; Knowles, 1973; Zimke &

Zimke, 1995). If the adult learner is a care giver, working a full-time job, and trying to balance school complications may arise. Without a supportive social or professional network, life responsibilities can get in the way of completing course work (Currie-Ruben, & Smith, 2014; Deggs, 2011). In an institutional longitudinal study at Monroe Community College, Marie Fetzner (2013) found that students who did not successfully complete online courses most often cited falling behind in the course and not being able to catch up as the number one reason for not completing online courses.

Institutional Barriers

Students who are motivated and do want to do well in their online courses may still struggle when it comes to receiving the help or guidance they request (Deggs, 2011). If the institution is struggling to provide academic resources (advisors, financial aid, technical support, tutoring) students may become frustrated and decide not to continue their course work. Online degree programs require a significant amount of buy-in from all institutional members (administrators, support staff, and faculty) (Allen & Seaman, 2015).

Technological Barriers

In spite of the continual development of new and faster technology, not all adult students may have access to the technology they need to be successful in the classroom. Accessibility for those with disabilities may be an issue in courses (Elias, 2010). Access to high-speed Internet or reliable technology can also present problems for online learners. Though many students have access to technology, any issue with equitable access or technology can negatively impact the students' experience and abilities to complete their coursework (Fetzner, 2013). Ability to successfully navigate and use

technology (both hardware and software) is considered a skill related to digital literacy (American Library Association, 2016).

Studying barriers to adult student re-entry and persistence is important to accurately address the needs of the learners. Adults prefer taking online courses for their flexibility and convenience (Aslanian & Fischer, 2022). Lacking access to reliable and affordable Internet and technology resources impacts this already vulnerable student group. Additionally, Wang et al. (2003) made the point that assumptions cannot be made about the digital literacy of the adult population, particularly millennials. All barriers have to be identified, and interventions delivered.

Studies Exploring Adult Student Barriers

This literature review began with research in the area of adult learners in an online setting in ERIC, EBSCOHost, JSTOR, Google Scholar, the Online Consortium website, and the Bureau of Labor Statistics. This search produced 20 relevant articles. The following criteria was used for inclusion in this review: (a) the article related to the design and implementation of pedagogy used in the LMS of online courses, (b) the article focused on the adult learner experience in online course settings, and (c) the article discussed barriers to or elements of success in the online setting. Four articles discussing distinct studies met the outlined criteria. The characteristics of the participants are discussed in Table 2-1, and the research questions and findings are listed in Table 2-2.

Table 2-1*Characteristics of Study Participants*

Study	Number of Participants	Student Classification	Student Degree Level	Participant Previous Online Experience	Institution Type
(Deggs, 2011)	21	Adult Learner	bachelor	100%	State Institution
(Ismail, 2011)	22	Traditional (10) Adult Learners (14)	bachelor	100%	Private Religious Institution
(Pamuk, 2012)	4,000* Qualitative/ 1,625* Quantitative	Adult Learners	bachelor	14%*	International Institution
(Wang et al., 2003)	21	Adult Learners	graduate	100%	Undetermined

Note. *Study contained both qualitative and quantitative research, participant numbers for each part of the study are reflected.

Three of the four studies had similar numbers of participants, and information was gained through qualitative coding of student work and/or interviews with students, with one of the small studies also using quantitative methods. The fourth study was conducted on a much larger scale and had a percentage of participants who elected to fill out a quantitative survey in addition to having the information for their discussion boards qualitatively coded. Of note is that the smaller studies reported 100% of those participating in the study had previous online learning experience. Comparisons in institutional types was interesting, particularly the participants' variation. The research questions and findings are reported in Table 2-2.

Table 2-2*Study Objectives, Method, and Results*

Study	Method	Research Objectives/Questions	Study Results
(Deggs, 2011)	Qualitative	Barriers among adult learners	Barriers that were perceived by adult learners were: 1. Intrapersonal barriers 2. Career and job 3. Academic related barriers Methods to cope with barriers – time management and organization, regular communication with faculty, being persistent, seeking out knowledge in person, relying on internal drive, taking time to relax and refocus
(Ismail, 2011)	Qualitative	Does an embedded librarian in an online course promote success and provide benefits to online adult learners?	One direct person to interact with is helpful. Students felt connected. Not necessary to interact in the LMS system.
(Pamuk, 2012)	Mixed (Qualitative & Quantitative)	1. How do adult learners evaluate their online learning experience? 2. What are the main components of an effective pedagogical approach in online learning environments from adult learner perspectives? 3. What would be done differently from learners' perspectives to improve pedagogy of teaching and learning online?	1. Pedagogical planning before teaching online 2. Social presence through interactions 3. Importance of feedback
(Wang et al., 2003)	Mixed (Qualitative & Quantitative)	a) Can online communities be formed between international participants? b) Does gender make a difference in participant interaction? c) Do cultural differences impact the feeling of community?	Three main markers for community formation in an online setting: 1. Active participation 2. Forming of shared identities 3. Establishment of a social network

Three of the four studies had similar numbers of participants, and information was gained through qualitative coding of student work and/or interviews with students, with one of the small studies also using quantitative methods. The fourth study was conducted on a much larger scale and had a percentage of participants who elected to fill out a quantitative survey in addition to having the information for their discussion boards qualitatively coded. Of note is that the smaller studies reported 100% of those participating in the study had previous online learning experience. Comparisons in

institutional types was interesting, particularly the participant's variation. The research questions and findings are reported in Table 2-2.

These studies, though different, share the same concepts for understanding adult learner needs in an online course setting. Barriers do exist to a greater extent for adult learners in the online course setting (Deggs, 2011). Social interaction between students and with the instructor fosters an online environment that aids adult student success (Deggs, 2011; Ismail, 2011; Pamuk, 2012; Wang et al., 2003). Feedback plays an important role in adult learners understanding of the material in the course, their progress in the course, and connection with the instructor (Ismail, 2011; Pamuk, 2012). When this information is used to create an online course, there is a greater likelihood that adult students will succeed. Building communities builds strong connections with material, classmates, and faculty build self-efficacy for the learners. Easy access to the Internet and familiarity with technology are necessary for adult student comfort online (Wang et al., 2003). Strong connections depend on strong connections.

CHAPTER 3

METHODS

Introduction

Adult college students face challenges in persisting with their education that traditional aged college students do not typically encounter. These challenges come in the form of four different types of barriers. As higher education leaders work on infrastructure to attract back and retain adult students wanting to finish an undergraduate degree, it is imperative to understand the barriers that these students face. Dispositional and situational barriers are student-centered, meaning that each individual student will have different dispositional and situational challenges. Academic barriers are those barriers that exist within the structure of present-day higher education and are arguably the barriers that higher education leadership can address.

Technological barriers prove to be a bit more mysterious and typically revolve around the ideas of access (to technology and the Internet) and ability (digital literacy). To fully understand the challenges presented by technological barriers, one must understand the geosocial and socio-economic factors of the potential student population. This dissertation is an applied study and used freely available open datasets collected and reported by the United States Census Bureau's ACS and the FCC's Form 477. The study analyzed the geosocial and socio-economic factors that impact the abilities of adults with some college but no bachelor's degrees in Louisiana. The goal of this study was to

provide leadership recommendations that narrow the digital divide and thereby facilitate adult student persistence to degree completion.

Research Questions

R1: Based on United States Census and FCC data, what connectivity and geosocial factors (providers, location proximity) impact adults residing in Louisiana who have some college but no bachelor's degrees?

R2: Based on United States Census data, what socio-economic factors (unemployment, income, dependents) impact adults residing in Louisiana who have some college but no bachelor's degrees?

R3: How does this information inform higher education administration strategic planning in the recruitment and retention of adults living in Louisiana with some college but no bachelor's degrees?

Research Design

Archival research design typically falls into one of three research categories: historiographic, ecological, and new archivists (Ventresca & Mohr, 2002). This study has been designed as an ecological study. Studies fall into one of the three research categories based on how the study is designed around the following distinctions. The first distinction is coined as "few vs. many" (Ventresca & Mohr, 2002, p. 15). Researchers interested in using historiographic design use information from a single or limited number of resources. An ecological study that focuses on the relationships among the variables typically evaluates a wider scope of resources, whereas a historiographic study may only focus on one or two resources for research (Ventresca & Mohr, 2002).

The second distinction of this method has to do with the interpretation of the resources, meaning are results from the study “read vs. measured,” or interpreted versus calculated (Ventresca & Mohr, 2002, p. 16). Historiographic studies synthesize the information garnered from the sources used in research. This approach uses copious note-taking and a strategic approach to reading and tracking patterns in the readings, thus the ‘read’ distinction. Conversely, an ecological study may take a more traditional qualitative approach to organizing the resources through the use of coding (Ventresca & Mohr, 2002). Coding creates opportunities to organize the themes/characteristics of the data in a streamlined method and requires that the researcher draw her/his own conclusions about the information gleaned from the research. The inference or pattern of emerged relationships requires the researcher to apply meaning.

The third set of analytic distinctions determines if the approach to research is “descending vs. ascending” (Ventresca & Mohr, 2002, p. 16). This distinction references the approach to the research and the implicit theory of causality that the researcher applies to the study. A descending approach entails looking at a large swath of characteristics and narrowing to focus on specific characteristics/relationships/etc. An ascending approach would start with the details and widen to a larger picture. It is the difference of approaching a research topic from a macro versus micro level (descending) or micro level and scaling to macro (ascending) (Ventresca & Mohr, 2002).

The final set of analytic distinctions for archival research are between “object vs. relationship” and this distinction is in the intent of the researchers’ focus (Ventresca & Mohr, 2002, p. 17). Historiographic researchers are typically learning about individual or social objects, whereas ecological researchers are looking for relationships among their

research subjects (Ventresca & Mohr, 2002). Archivists may oscillate between researching individual or social objects and exploring relationships; how that distinction will be made depends upon the research topic.

This applied study took an ecological research approach. Ecological research searches to understand the relationship that organisms have with their environments (Baum & Shipilov, 1996). This study sought to understand a potential student population, the latent adult learners, for a specified geographic area, living in the state of Louisiana. The characteristics of that population are both geo-social and based on known socio-economic features. A number of geosocial and social economic factors have been examined as a part of this research study. Review of those factors were used as a measure of the proximity to technological barriers and resources. The study started from a macro (or large) breadth and narrow to focus on factors that enhance or minimize the digital divide. To understand which analytic distinction is best suited for the three different research areas see Table 3-1 based on Ventresca & Mohr's (2002) publication.

This applied study was designed to understand the landscape of the latent adult learner population in Louisiana and to use that information to highlight barriers and strategic interventions to engage and support that population by furthering educational attainment and bachelor's degree completion. In order to best understand this population, an organizational ecological approach was used. Ecological organizational research has three basic principles: (1) diversity is an attribute of pieces of organizations that have no comparable at the standard of the individual organization, (2) organizations typically have difficulty planning and executing changes fast enough to meet the demands of the changing and uncertain environment for which they exist, and (3) organizations are not

permanent; new organizations are created, and established organizations dissolve everyday (Baum & Shipilov, 1996).

Table 3-1

Archival Research Methods Distinctions

Archival Research Analytic Distinctions	Historiographic Research	Ecological Research	Archivist Research
Few: The number of resources explored in the study.	●		
Many: The number of resources explored in the study.		●	●
Read: Resources are read for a better understanding of the material.	●		●
Measure: Resources are measured for a relational understanding of the material.		●	●
Descending: Resources are sorted from a macro concept to a narrowed view.	●	●	
Ascending: Resources are sorted from micro concepts into a bigger picture.	●		●
Object: Research focuses on an understanding of an individual social object.			●
Relations: Research is used to understand if relationships exist and to what extent.	●	●	●

Note. Ventresca & Mohr, (2002) describe the distinctions of archival research methods.

It is through the study of these present-day artifacts that an analytical lens can magnify opportunities for change and alert organizational leadership to threats or trends

that impact organizational strategic planning. Baum and Shipilov (1996) state that the basic elements of an ecological analysis are “organizations, populations, and communities of organizations” (Baum & Shipilov, 1996, p. 55). Furthermore, a set of organizations with similar goals, resources, and actions constitutes a population (Baum & Shipilov, 1996; Hannan & Freeman, 1977, 1984). Populations, in turn form relationships with other populations (based on a variety of similarities), which produce organizational communities (Baum & Shipilov, 1996). When populations form organizational communities, they are typically doing so because their predominant functions are compatible and may serve or meet the needs of the now shared community (Baum & Shipilov, 1996).

Latent Adult Learners

The focus of this study was the latent adult learner population of people who have some college but no bachelor’s degree in the state of Louisiana. Louisiana currently has roughly 665,000 plus adults (25 years of age and older) living in the state who have some college but no bachelor’s degree (The ACS, 2020). Louisiana consistently ranks low for state population educational attainment. One of the populations that colleges and universities serve (and are expanding services for) are adult learners (students aged 25 years or older).

The latent adult student population has a prevailing characteristic; despite varying circumstances (professionally, personally, etc.), this population lacks a bachelor’s degree. To best serve the adult student population, it is imperative that the higher education community in Louisiana understand the barriers and challenges faced by the adult student population. A blind spot exists in higher education; the academy needs a better

understanding of the potential adult student population and the role that the digital divide plays in creating and sustaining technological barriers for that population. It is only through exploration of this population's geographic location that higher education administrators can glean the geo-social and socio-economic needs of these students and strategically plan to address these needs.

Data Sources

Identifying data sources was the first step in this research process. Openly-sourced data was preferred to private data. Information needed to be inclusive of both geographic location as well as socio-economic data. Further narrowing to a demographic of adults living in a specific state, Louisiana, who had some college experience but no bachelor's degree.

The researcher selected government sourced open data sets for the ecological mapping. Those resources were the ACS, an annual household survey developed by the United States Census Bureau, and the FCC Form 477, a bi-annual report of all organizations (including mobile providers and fixed) offering broadband specifying where they offer Internet access and the speeds (exceeding 200 kbps) in at least one direction (FCC, 2021).

The ACS is an ongoing yearly sample survey used to make estimates for the greater population. Survey responses, once collected, produce information about social, economic, housing, and demographic characteristics of Americans to track how the population changes from year to year. The ACS covers topics within the areas of social, economic, demographic, and housing of the populations living across the United States. Information from this survey is used to help determine how federal and state funding

(upwards of \$675 billion) is used and distributed (U.S. Census Bureau, 2022). The information collected highlights these areas: occupations, employment, educational attainment, veteran status, and provides information regarding where/if citizens have access to the Internet among other variables (U.S. Census Bureau, 2022). ACS data are primarily collected through mail-in (paper/pencil) surveys. Answers to the ACS may be recorded through telephone or in-person interviews as a follow-up to mail nonresponse. Any answers on the paper surveys do not rely on interviewers for interpretation of the survey questions. Answers to the ACS are collected, aggregated, and then shared through the United States Census Bureau website. Anyone with access to the website can download the data set in the form of a CSV (electronic spreadsheet). ACS data are available in yearly 5-year estimates and new and old data are available for download.

FCC Form 477 is a document produced by the organization through their collection of data from broadband and cellular providers. The form collects availability and coverage of both cellular data and fixed broadband resources as reported by the entities that provide those services (FCC, 2021). Data collected by the FCC for Form 477 is available on the FCC's website in the form of a CSV. The latest data are available through the website along with archived data.

Through the use of these two open data resources, an ecological model can be created to inform the understanding of both the latent adult student population in Louisiana as well as information regarding what resources and barriers are available regarding Internet access and hardware use.

Application and Analysis of Data Sources

The ACS 5-year estimate was a data source identified early in the exploration of data. As outlined above, the survey included geographic information, socio-economic information, educational attainment, and information about technology (both availability of Internet access and type and modality of Internet and technology use). Information about Internet availability and number of ways to access the Internet in Louisiana was found on FCC Form 477, another government-collected, open-sourced data set available to the public like the ACS estimates.

Identifying a system to interpret the data was the next step in the research process. A Geographic Information System (GIS), ArcGIS, was identified as a system built to interpret both geographic information and demographic information. After a GIS system was identified the help of a GIS specialist was arranged to help with the use of the software system. Survey data was selected to view in sequences. The next chapter outlines the process of building and layering maps as they were created. The research approach followed the characteristics of archival research design: many sources considered (vs. few); results were read (vs. measured); the information was sorted in a descending/narrowing fashion (vs. ascending); and results were interpreted through the use of coding and exploration for relationship (vs. object). The next chapter outlines the entire inquiry process.

Researcher Bias

The researcher has a vested interest in the results of this study. Experiences as a higher education professional shaped anticipation of the modeling outcomes. A preconceived notion was the infeasibility of potential adult students completing all

schoolwork on a mobile device. As an example, researching and writing a dissertation on an iPhone would prove to be a tremendous challenge if not entirely impossible.

Additionally, access to computers (hardware) may be an additional technological *and* academic barrier that higher education can provide an intervention to solve. Another preconceived bias was acknowledging that a large percentage of potential adult students are not digital natives, meaning that this population may not have had regular access to technology during childhood. That recognition then dictated that the use of technology may prove challenging and test adult student persistence, regardless of the quality of access to the Internet. As a scholar of communication, it is understood that if a population's only means of access to the Internet has been through a mobile device, then students may struggle adjusting their communication styles to meet the expectations of their faculty members.

CHAPTER 4

RESULTS

Introduction

Adult students face many challenges returning to higher education to start or complete degrees. These challenges can be categorized as different types of barriers: dispositional barriers, situational barriers, institutional barriers, and technological barriers. Technological barriers are exacerbated by the digital divide. Cullen (2005) described the digital divide as a gap that exists between those with knowledge and access to the Internet and computing technology/communications, and those without access or adequate knowledge to navigate the Internet and/or computer technology/communications. This applied study sought to understand the extent of the digital divide in Louisiana and how that divide impacts the potential adult student population among people who have college experience but no bachelor's degree.

Data Articulation to Map Design

Maps were created using openly sourced data from the United States Census Bureau's ACS 2019 5-year estimates and FCC Form 477 reflecting data from summer 2020. The maps were created using a software called ArcGIS. This software has the capability to take information recorded in spreadsheets and articulate a visual depiction of the data based on geographic coordinates and computer programming.

The visual depictions of the data are set on a dark background and, where possible, use color swaths that are noticeably contrasted for easy dissociation for those with any degree of colorblindness. It should be noted that maps in the printed dissertation text will reflect a gray-scale color scheme, the darkest hue represents the highest percentages of populations (80%-100%) and the lightest hue represents the lowest percentages of the populations (less than 20%). The maps were created using population density formatting (map uses a stark contrast between the background and the dots as an accommodation for some visual impairments) and heat maps (maps that use a range of colors to display the prevalence of the measurement). Where possible, accommodations were made for inclusive Americans with Disabilities Act of 1990 (ADA) compliant visual aids. Regional universities from the largest Louisiana university system are geographically represented by graduation caps. The universities were included for geographical reference and will be included on every map iteration to serve as a fixed reference point. Various data components are represented by symbols and/or colors and legends are included with each map visualization.

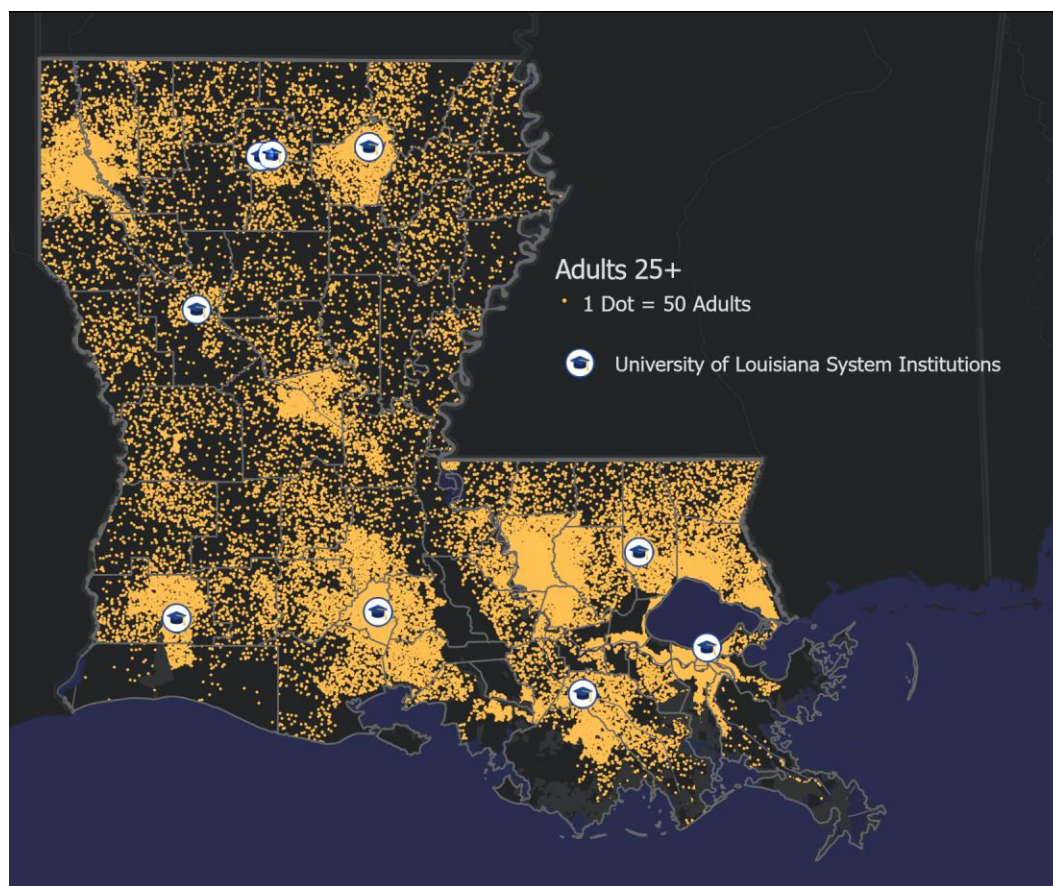
Data Depiction and Interpretation

The first geographic depiction that was created was the population density map showing Louisiana adults aged 25 years or older (Figure 4-1). This category distinction is how the ACS categorizes adults, and it aligns with the description given to adult learners by Malcom Knowles (1973). As discussed in Chapter 3, this archival research method took an ecological approach to the study and thus this first delimitation was the largest swath of the population that would be examined. This demonstrates the descending characteristic of archival research methods that is an attribute of ecological study. The

background of the map is black and the population density is depicted in neon orange dots. The dot density is one orange dot equals 50 adults (25+ years) living within that geographic zip codes. Data were available down to the census tract (a measurement smaller than a zip code), but all information depicted on the maps included in this research are depicted by zip code. This decision was made for the ease of use and understanding of users; the general population understands the concept of zip codes and can identify their own, whereas identifying census tracts may be a more abstract concept.

Figure 4-1

Adults Living in LA 25+

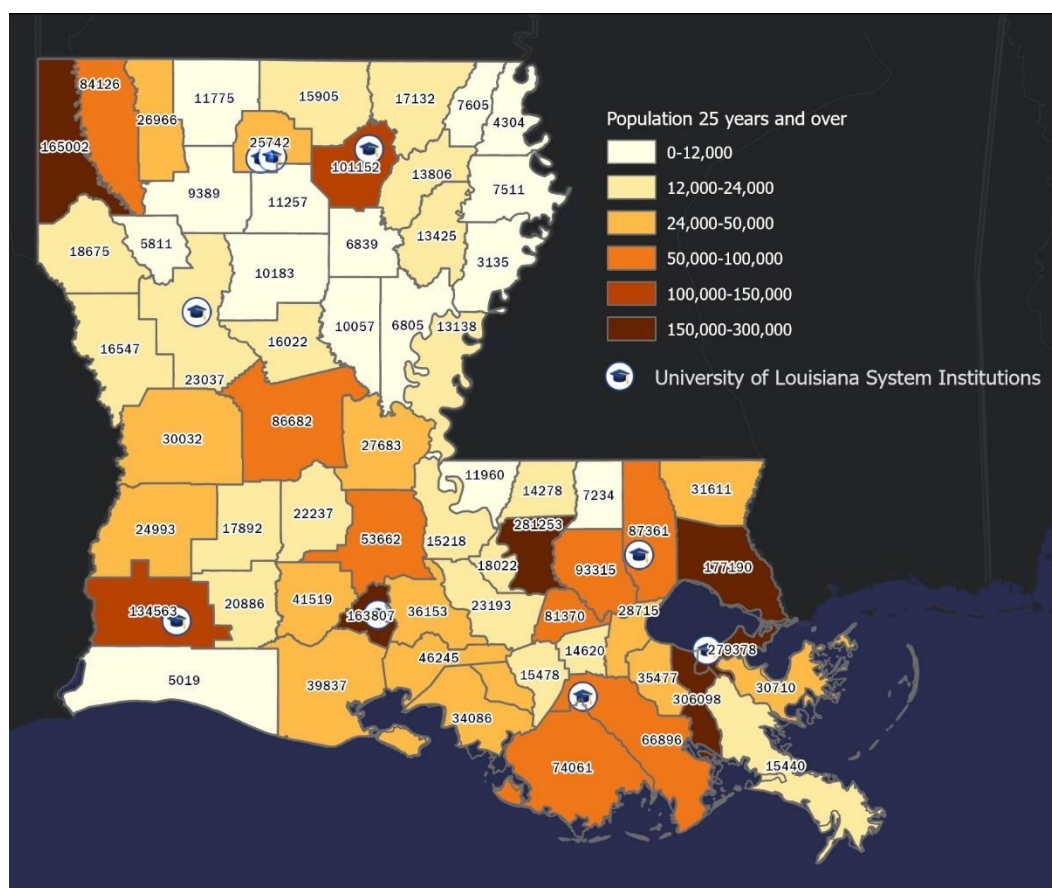


Note. Each dot represents 50 adults living in Louisiana (U.S. Census Bureau, 2022)

After review of the research it became clear that a dot density map could be misleading about the population (number of adults living in a geographic area) and saturation (the percentage of population that are adults living in a geographic area) of the mapped areas. Figure 4-2 is an additional map created to better reflect the population of adults in Louisiana with some college but no bachelor's degree.

Figure 4-2

Adults Living in LA 25+ Population by Parish



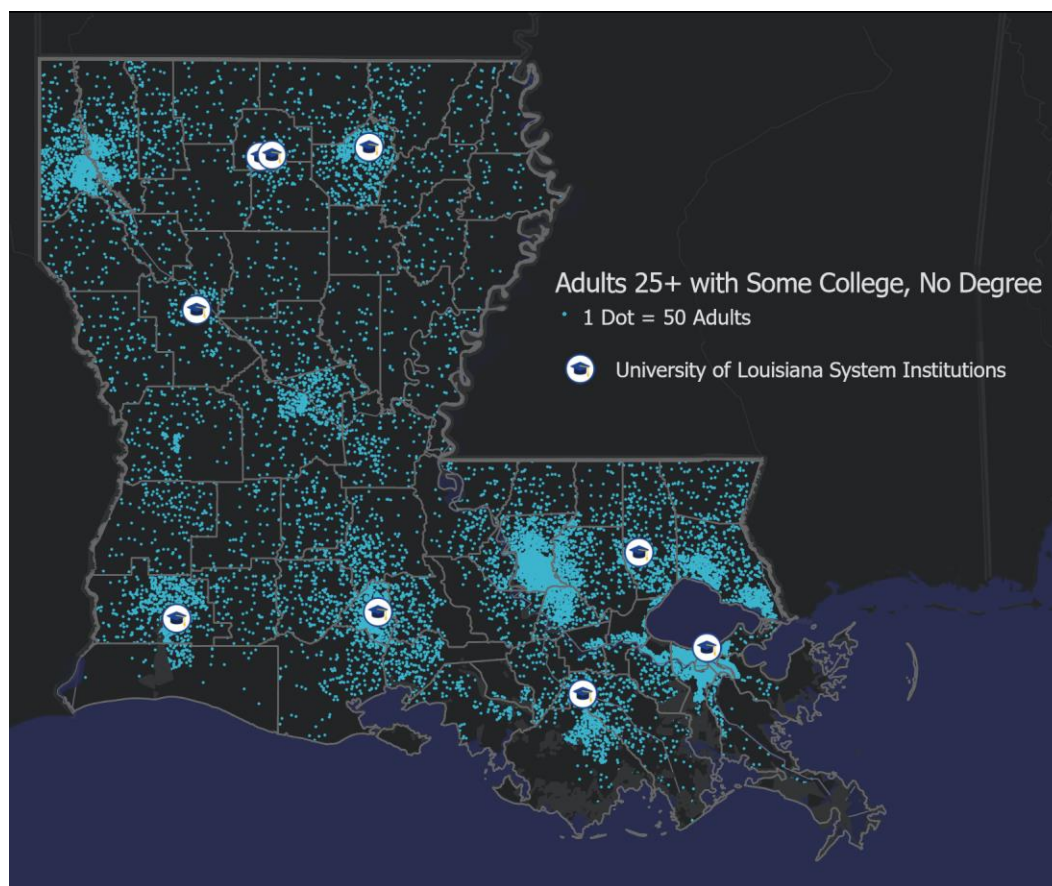
Note. Each hue of orange indicates the saturation of the adult population by parish in Louisiana (U.S. Census Bureau, 2022).

Once the population of adults (25+ years) was identified, the data set could be narrowed to adults who have some college experience but no bachelor's degree. The

following delimitations were made: adults 25 years or older; living in Louisiana; with some college but no bachelor's degree. The ACS asks questions about educational attainment, so participants can indicate their level of education. The image showed a wide swath of this population across the state. Each dot on the dot density map represented 50 adults that had some college experience, no bachelor's degree (dots are in blue). This demonstrates that higher educational attainment need exists at every corner of the state of Louisiana (Figure 4-3).

Figure 4-3

Adults Living in LA 25+ with Some College Credit but No Degree

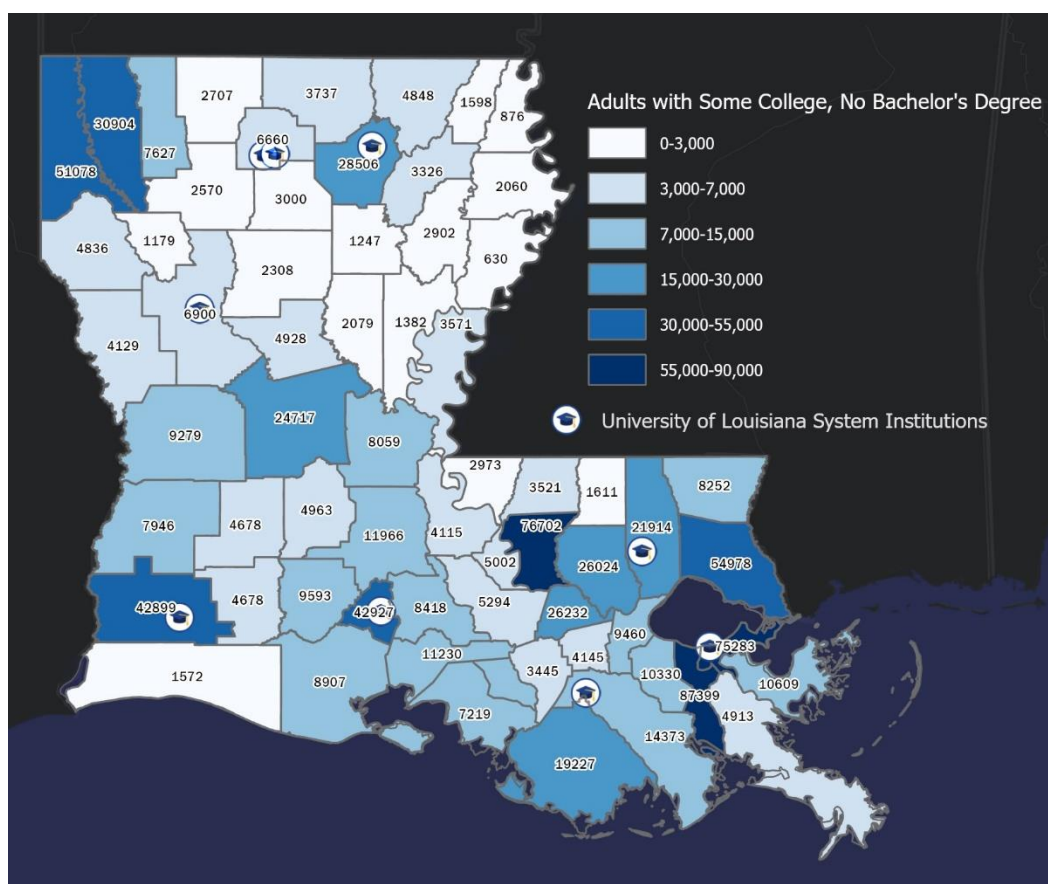


Note. Each dot represents 50 adults living in Louisiana with some college experience but no degree (U.S. Census Bureau, 2022)

Similarly, to Figure 4-1, Figure 4-2 upon review of research needed clarification between population and saturation that the dot density map did not provide. An additional map was created to show population density of adults with some college experience but no bachelor's degree by parish to clarify between parishes largely saturated with adults who have some college experience but no bachelor's degree and highlight the differences in population (Figure 4-4).

Figure 4-4

Adults Living in Louisiana Age 25+ Population by Parish with Some College Experience but No Degree

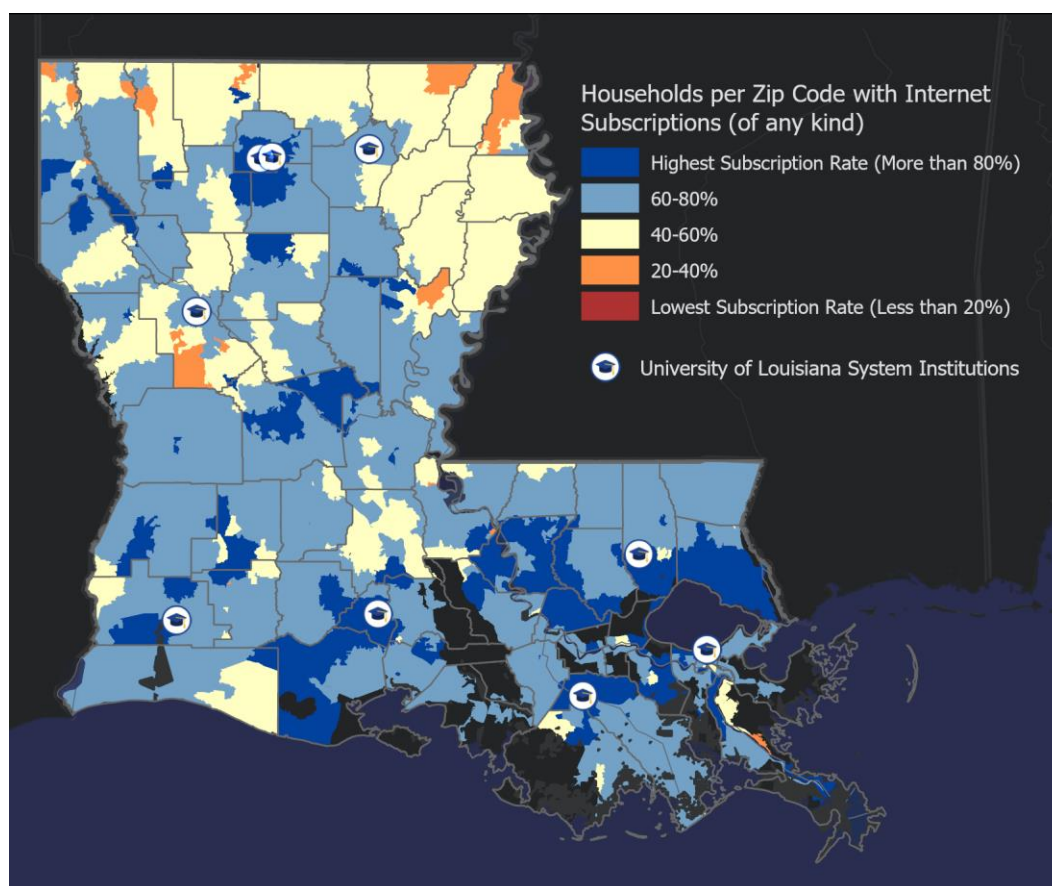


Note. Each hue of blue indicates the saturation of the adult population with some college experience but no degree by parish in Louisiana (U.S. Census Bureau, 2022).

Internet Subscription Rates

Once the target population was narrowed, an analysis of geosocial and socioeconomic features could begin. The start of the study identified who has access to the Internet through subscription service in Louisiana. The question on the ACS is asking if the survey taker has access to the internet through a subscription service. Note, the question does not ask about modality or device, only if any Internet subscription exists. The basic layout of this first map, Figure 4-5, depicting Internet subscriptions will be used as a background in a majority of the maps used. When a different coloration is used, it will be noted in the mapping description. All colors selected for map shading were run against a colorblind saturation scale to ensure visibility for those with visual impairments.

At first glance this image shows that there are clear disparities with Internet access, but access to the Internet seems to be fairly strong and wide-spread across the state (much stronger representation than the researcher envisioned). Areas of Louisiana shaded the darkest hue of blue have the highest rate of household Internet subscription; more than 80% of households have an Internet subscription. Those in a lighter shade of blue are relatively well connected with 60%-80% of households within the zip code subscribing to a service for Internet. Areas shaded in a light-yellow show household in zip codes where 40%-60% of households report an Internet subscription. Parts of the map that are shaded in orange are some of the areas with the lowest reported Internet subscriptions, only 20%-40% of households within those areas have an Internet subscription. However, there are three zip codes in the state where less than 20% of households have an Internet subscription of some type. These areas appear in the color red if the map were to be magnified to the zip codes' geographic location.

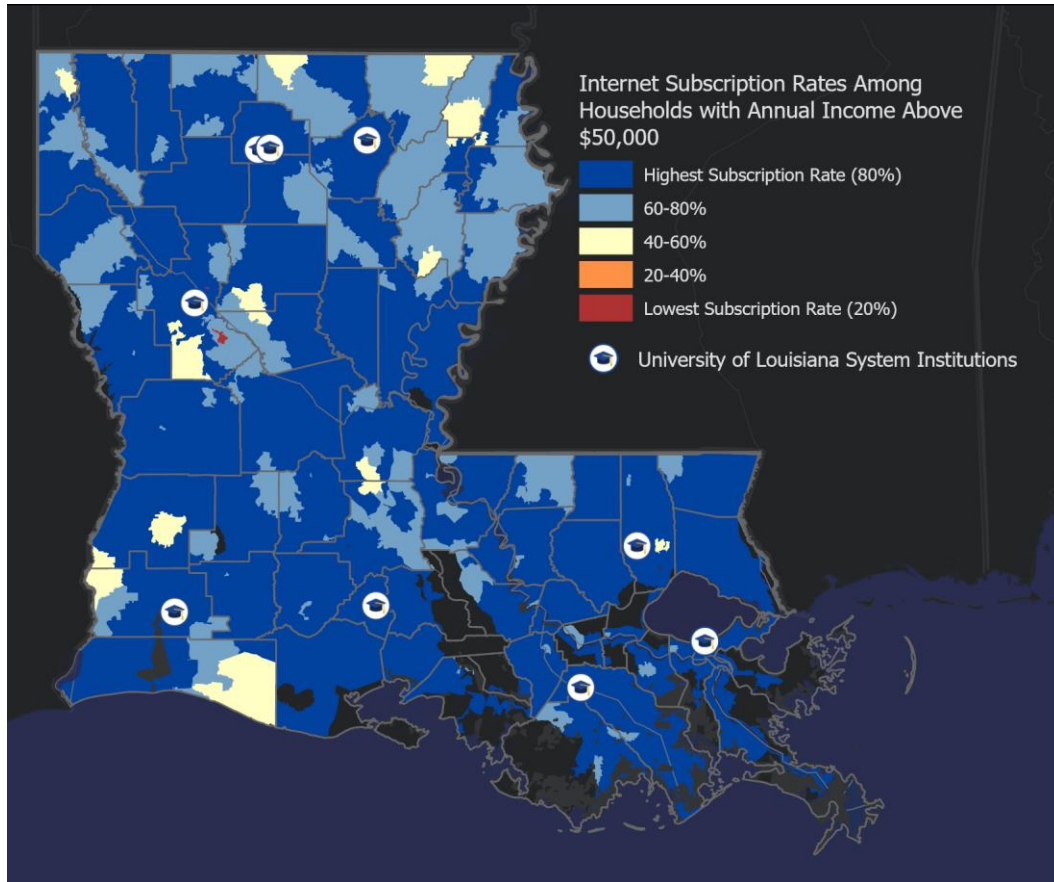
Figure 4-5*Households by Zip Code with Internet Subscriptions*

Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by United States Census block in Louisiana (U.S. Census Bureau, 2022)

After exploring the availability of Internet access, the researcher focused on equity of available Internet options for households at various income levels, narrowing the data based on median household income information. This information led to the creation of maps that depicted households by zip code with Internet subscriptions by household median income. Narrowing to this socio-economic characteristic gives a clearer picture of the targeted student population (adults with some college experience but no bachelor's degree) access to the Internet (Figure 4-6).

Figure 4-6

Households by Zip Code with Internet Subscriptions at or Above the Median Income Level for Bachelor's Degree Holders



Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by the median household income of a bachelor's degree holder in Louisiana, \$50,018, by United States Census block in Louisiana (U.S. Census Bureau, 2022)

As established in Chapters 1 and 2, economic promise is tied to educational attainment. Adults that are in the median income bracket or lower stand the most to gain from educational attainment. The first socio-economic delimitation was for those that were above the median income level for citizens holding a bachelor's degree in the state: households reporting income at or above \$50,018 annually (U.S. Census Bureau, 2022).

Almost the entire map was a shade of blue, with the darkest hue of blue (or highest level of subscription rate) the predominate color on the map. Noticeably, there is one spot of red on the map that stands out as an area that no matter the resident's income level the availability of Internet service is non-existent and reflects a geographic impediment to Internet access. A few areas, most of those closest to the perimeter of the state, have only 40%-60% Internet connectivity per household.

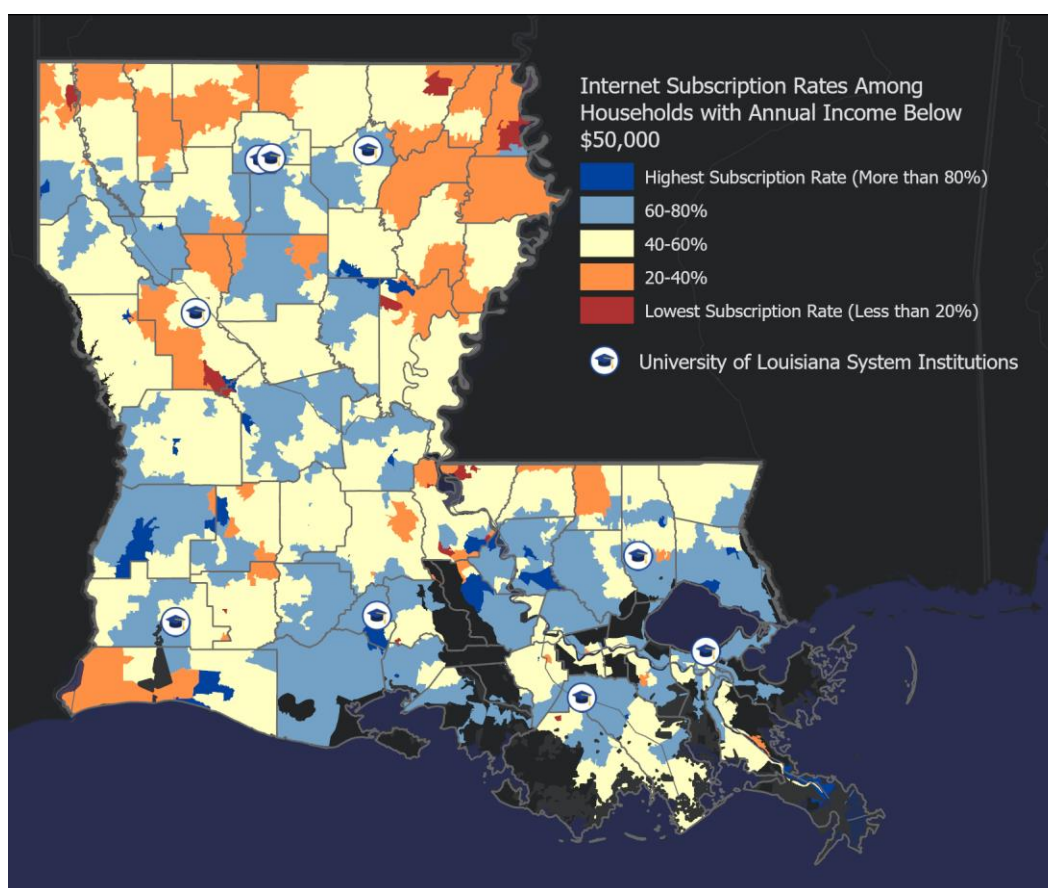
The next delimitation in socio-economic status was to look at households below the median household income in Louisiana, \$49,469. Note, this income is only \$549 lower than the median household income of those with a bachelor's degree in Louisiana. Internet subscription rates for households with adults who have some college experiences but no degree are depicted in Figure 4-7.

It is clear that \$549 dollars in annual household income may be a key figure in the investment of Internet access. The majority of the map is the light-yellow color, meaning that only 40%-60% of the Households by zip code living below the median household income level have an Internet subscription. Pockets of the map show areas that have 60%-80% of households that have access to the Internet through a subscription service. Larger areas of orange shading are spread across the state indicating that only 20%-40% of households have an Internet subscription, and there are more than a dozen clusters of zip codes where less than 20% of households below the median income level have a subscription that provides them with Internet access. Comparing this image and the one above it (Figure 4-5 and Figure 4-6), it is clear that less than \$600 annually makes a significant difference in households that have an Internet subscription.

The median level of income in Louisiana for a resident that has some college experience but no bachelor's degree is \$35,000 (U.S. Census Bureau, 2022). The difference between the population's annual income for map (Figure 4-7) and (Figure 4-8) ranges between \$15k - \$30k lower than those Louisiana residents at the median household income for Louisiana.

Figure 4-7

Households by Zip Code with Internet Subscriptions at or Below the Median Income Level

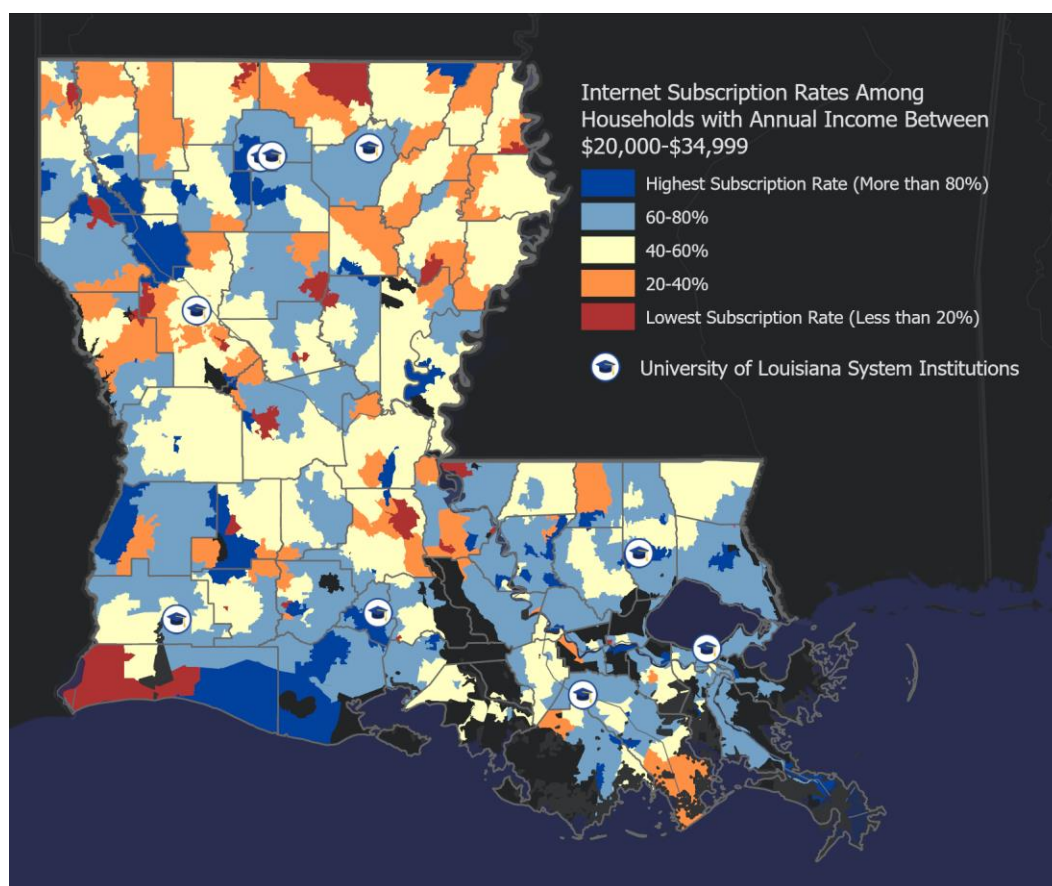


Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by the annual household medium income of Louisiana residents, \$49,469, by United States Census block in Louisiana (U.S. Census Bureau, 2022)

Parts of the map changed from orange to red, signifying that Internet subscriptions in some areas of the state go from 20%-40% of households accessing the Internet to below 20%, or the lowest level of access to an Internet subscription.

Figure 4-8

Households by Zip Code with Internet Subscriptions at or Below the Median Income Level for Some College No Bachelor's Degree



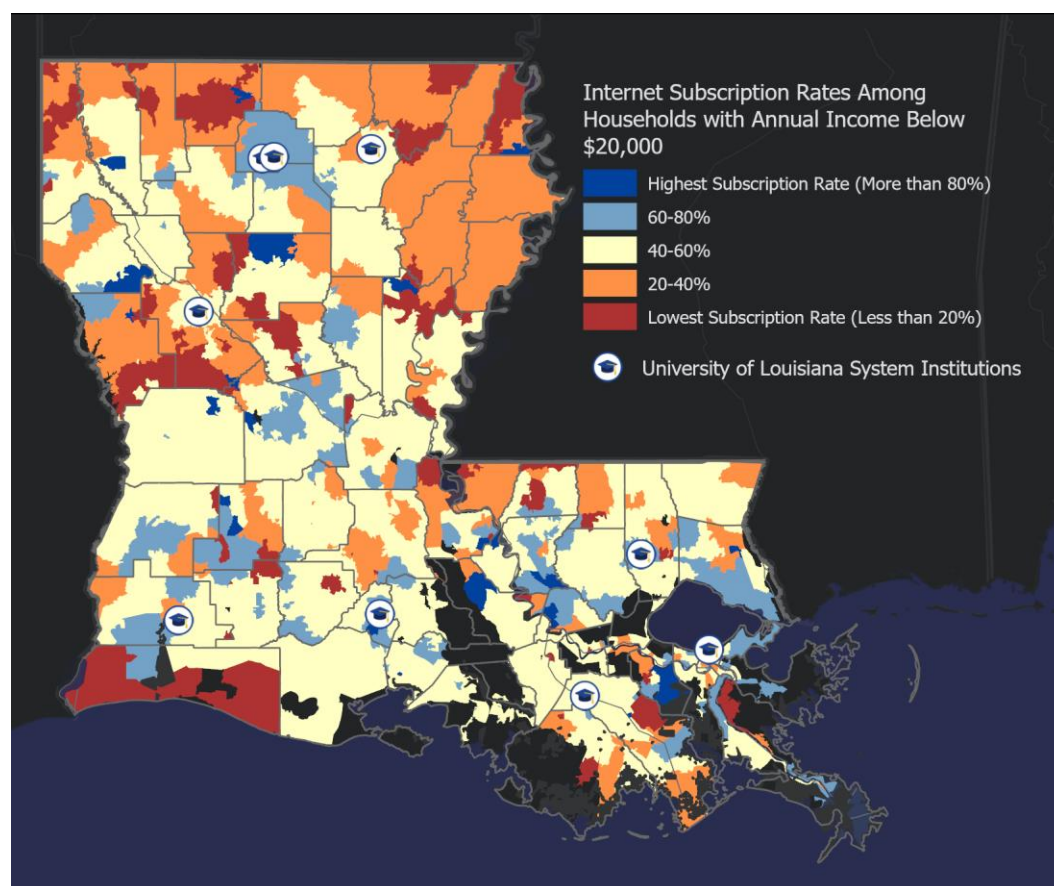
Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet with a median household income below \$35,000 by United States Census block in Louisiana (U.S. Census Bureau, 2022)

Furthermore, when examining those living at or below the poverty line for the state (individual household income of \$12,140 or lower or \$25,100 for a family of four), the map displays significantly less blue shading and an increase in the warmer colors on

the map, most notably oranges and reds, or the lowest levels of Internet subscriptions. It is clear in Figures 4-4 through 4-9 that income does play a significant role in the ability for a Louisianan to have access to the Internet in their homes.

Figure 4-9

Households by Zip Code with Internet Subscriptions at or Below the Poverty Level for Some College No Bachelor's Degree



Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by median household income under \$20,000 by United States Census block in Louisiana (U.S. Census Bureau, 2022)

Accessing the Internet

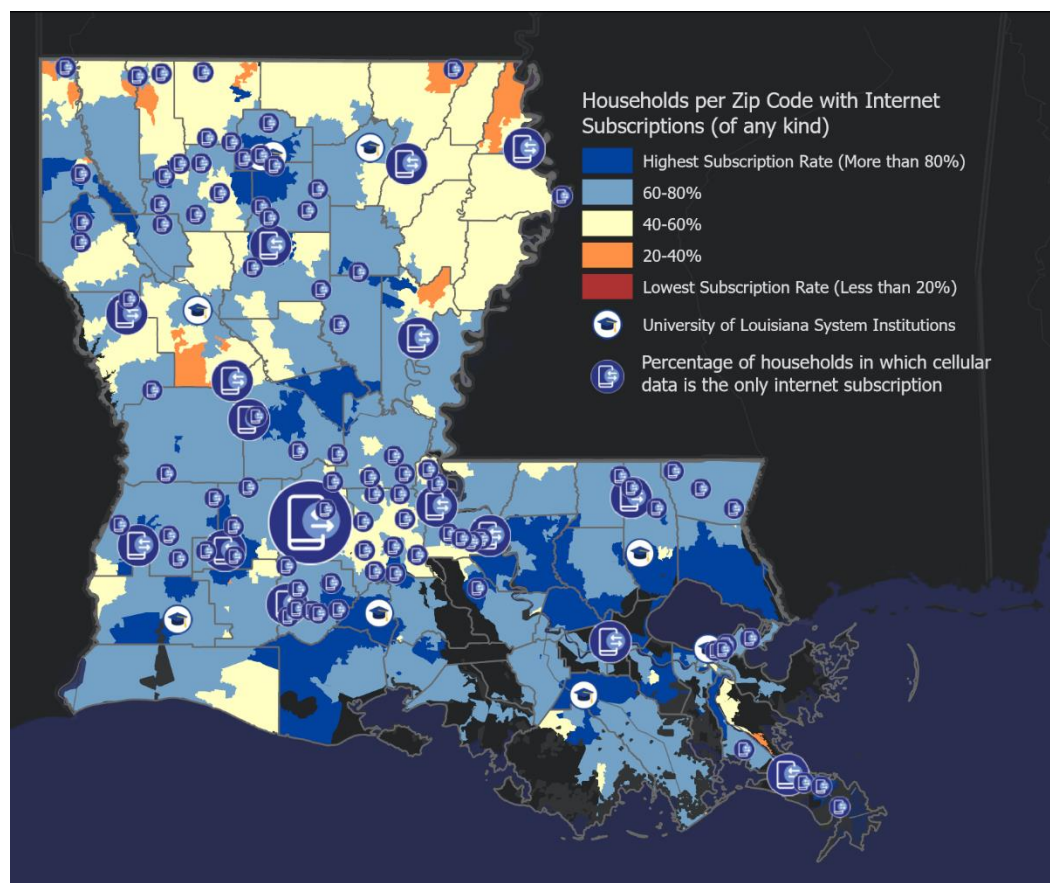
The next data set mapped provided information about what type of Internet access Louisianans have. This question differentiates residents receiving Internet access through

broadband Internet connection or from mobile/cellular network access. Figure 4-8 shows the number of households accessing the Internet by mobile/cellular data plans. The symbol of a smartphone with arrows pointing both left and right was used to depict the representation for households that depend on their cellular network to connect to the Internet. The symbols can be seen on the map in three different sizes: small, medium, and large. The small symbols represent 20%-40% of the population within that zip code relies on a cellular data plan for access to the Internet. Medium sized symbols represent 40%-60% of the population within that zip code relies on a cellular data plan for access to the Internet. The largest size of these symbols represents 60%-80% of the population within that zip code relies on a cellular data plan for access to the Internet.

Mobile broadband is available through several different cellular data plans that are available from a number of cellular providers, with most of the providers in the state of Louisiana operating on AT&T, Verizon, and T-Mobile cellular towers. Other providers (Suddenlink, Comcast, Consumer Cellular, etc.) are providing service through one of the big three provider towers (FCC, 2021). Cellular data are more widely available throughout the state (Figure 4-9) than broadband connectivity (as shown in Figure 4-10). Cellular data may have certain restrictions based on the cellular data plan the consumer has chosen.

Figure 4-10

Households by Zip Code with Internet Subscriptions and Percentage of Households in which Cellular Data are the Only Internet Subscription



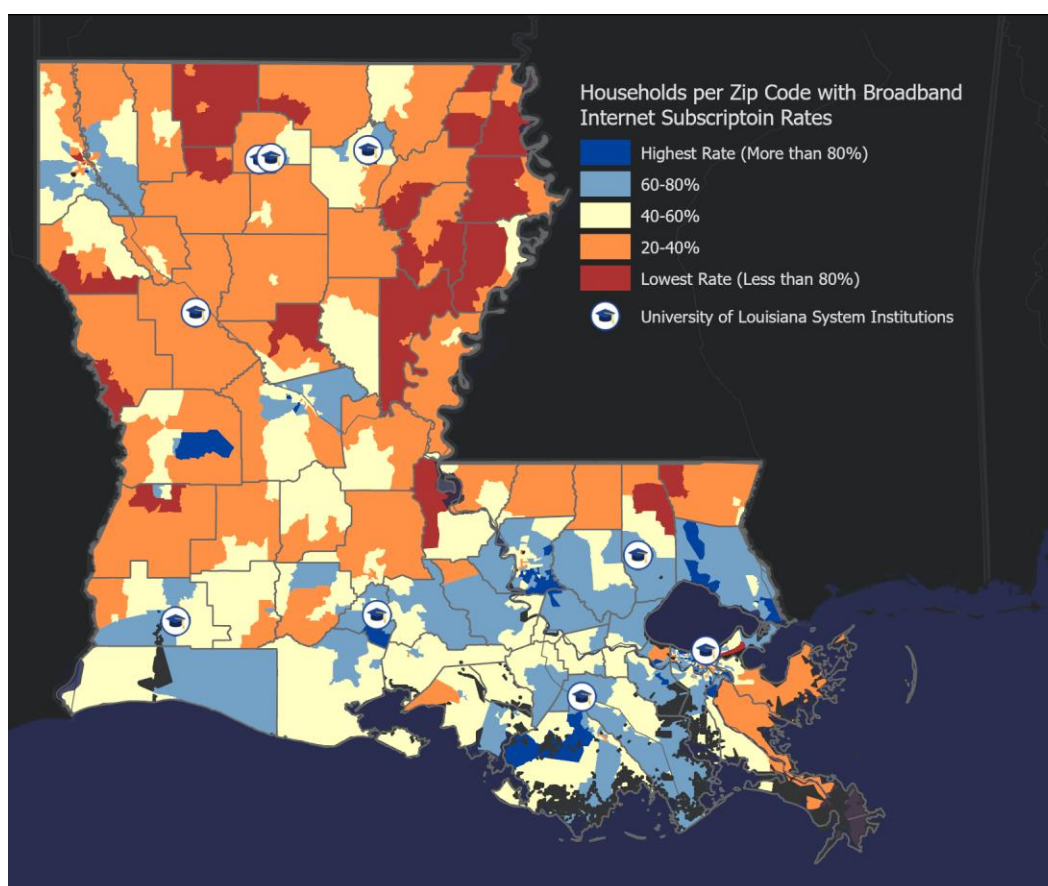
Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by United States Census block in Louisiana. Additionally, cellular device symbols varying in size depict the percentage of households in which cellular data are the only Internet subscription by the United States Census Bureau (U.S. Census Bureau, 2022)

The Organization for Economic Co-operation and Development (OECD), an intergovernmental economic organization with 38 member countries, defined mobile broadband as mobile subscriptions that advertise data speeds of 256 Kbits or greater. Subscribers must be able to access the Internet and must be used to make a data connection through Internet Protocol (IP) in the previous three months. The OECD

(2022) is clear that even if a device is capable of sending or receiving SMS and MMS messages (types of text messages), if it does not have the data speeds of 256 Kbits or faster and is not utilizing an IP address, the device is not considered to have mobile broadband (Figure 4-11).

Figure 4-11

Households by Zip Code with Broadband Internet Subscriptions



Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet through broadband connection by United States Census block in Louisiana. By the United States Census Bureau. (2022). (U.S. Census Bureau, 2022)

Broadband Internet is defined as Internet that can reach a minimum speed of 25 megabits per second (Mbps) download speeds/ and 3Mbps upload speed. Download

speed refers to the power needed to retrieve something from the Internet (files, articles, videos, recordings); upload speed refers to the power needed to transfer information from the user's computer to the Internet (Rachfal, 2021). Upload speeds have become more important as video conferencing has become more popular thanks to applications like Zoom, Microsoft Teams, and WebEx. Broadband Internet is the most secure and fastest way to access the Internet and has been touted by educators as a necessity to learning online (Rachfal, 2021). To understand broadband Internet subscriptions, the Figure 4-9 map's color composition was changed to reflect the percentages of households that had broadband Internet subscriptions.

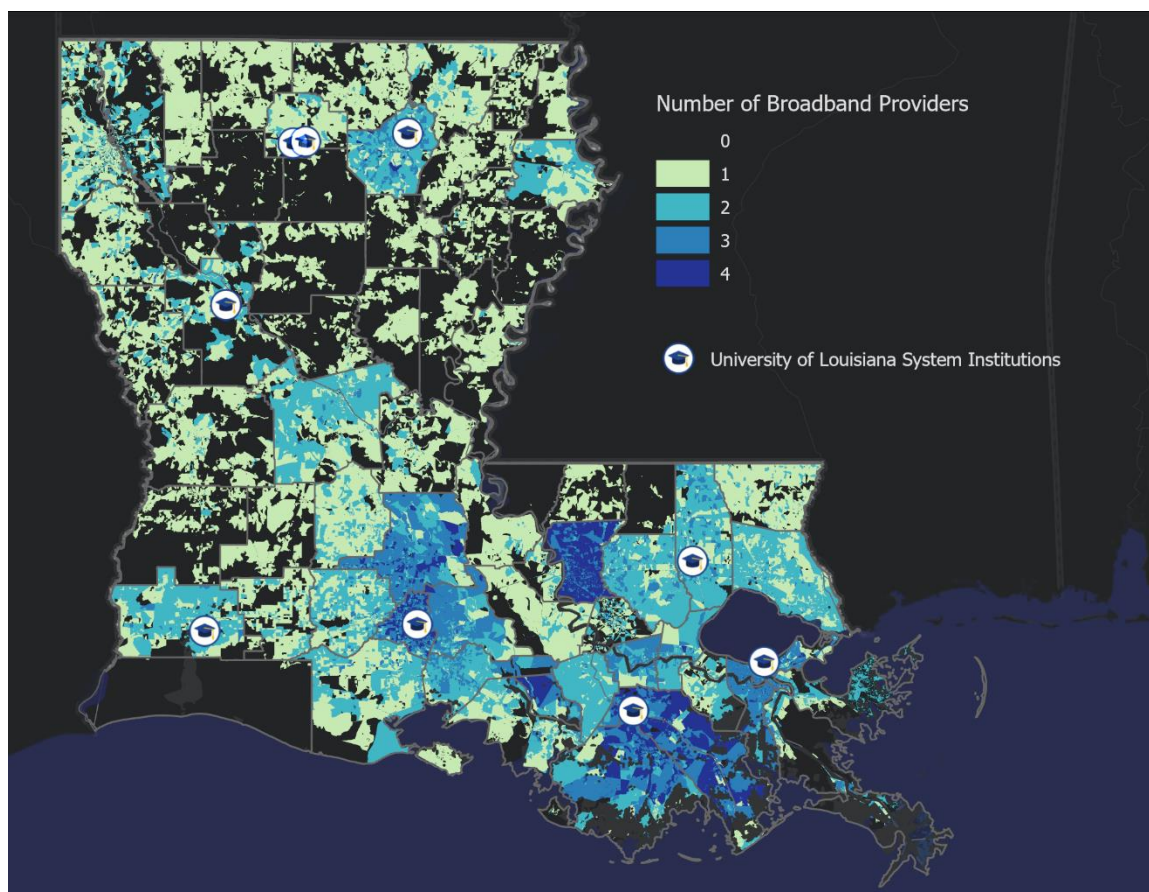
At first glance, it is clear that Louisiana has a much lower rate of broadband Internet subscriptions than cellular data plans. A majority of the map reflects the warmest colors of our spectrum, with a majority of the lower half of the state reflecting yellow (40%-60% of households with broadband access) and a majority of the upper half of the state reflecting orange (20%-40% of households with broadband access). The lightest hue of blue (60%-80% of households with broadband access) is scattered across the southwestern, south-central, and southeastern parts of the state. Red is a prominent color depicted in the northeastern and north central parts of the state, it means that residents in those areas have a less than 20% likelihood of having broadband Internet access at their homes. This is the map that most closely reflected the assumptions of the researcher about Internet connectivity and access in Louisiana.

To understand why broadband Internet connectivity is so dramatically different than mobile broadband with cellular access requires examining the number of broadband providers available within the state. Figure 4-12 highlights why broadband connectivity is

limited in certain areas across the state. Areas that do not have access to any type of broadband service provider are clearly going to be red on our maps. Areas that have one or two service providers also make sense to reflect a warmer color on the map (yellow, orange, or red). It is the areas that have more than two service providers, some with a max of four providers, which are the most interesting.

Figure 4-12

Broadband Service Providers per Zip Code



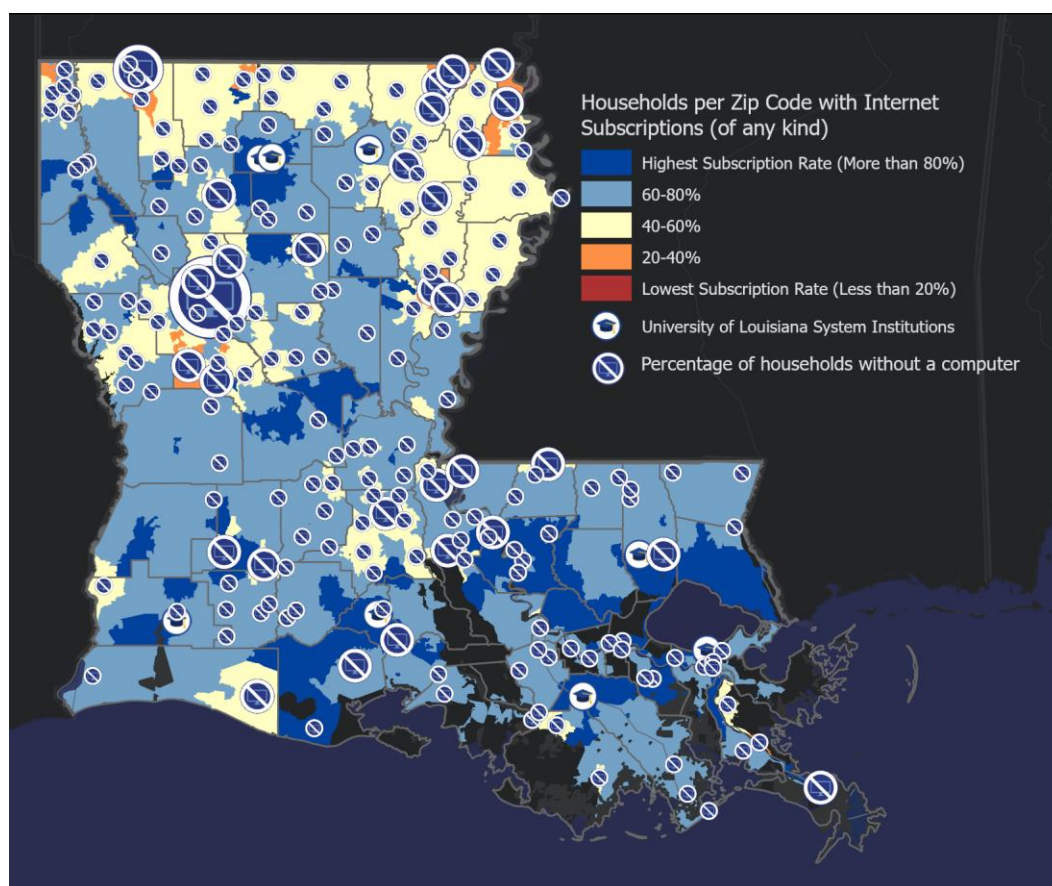
Note. Each hue indicates availability of broadband Internet providers in Louisiana. This information was collected from the FCC. (FCC Form 477, 2021)

For Louisiana residents with multiple access points, to not have the investment in broadband raises questions about price of access for broadband service as well as the Louisiana residents' perceived need to have broadband Internet service.

Devices to Use the Internet

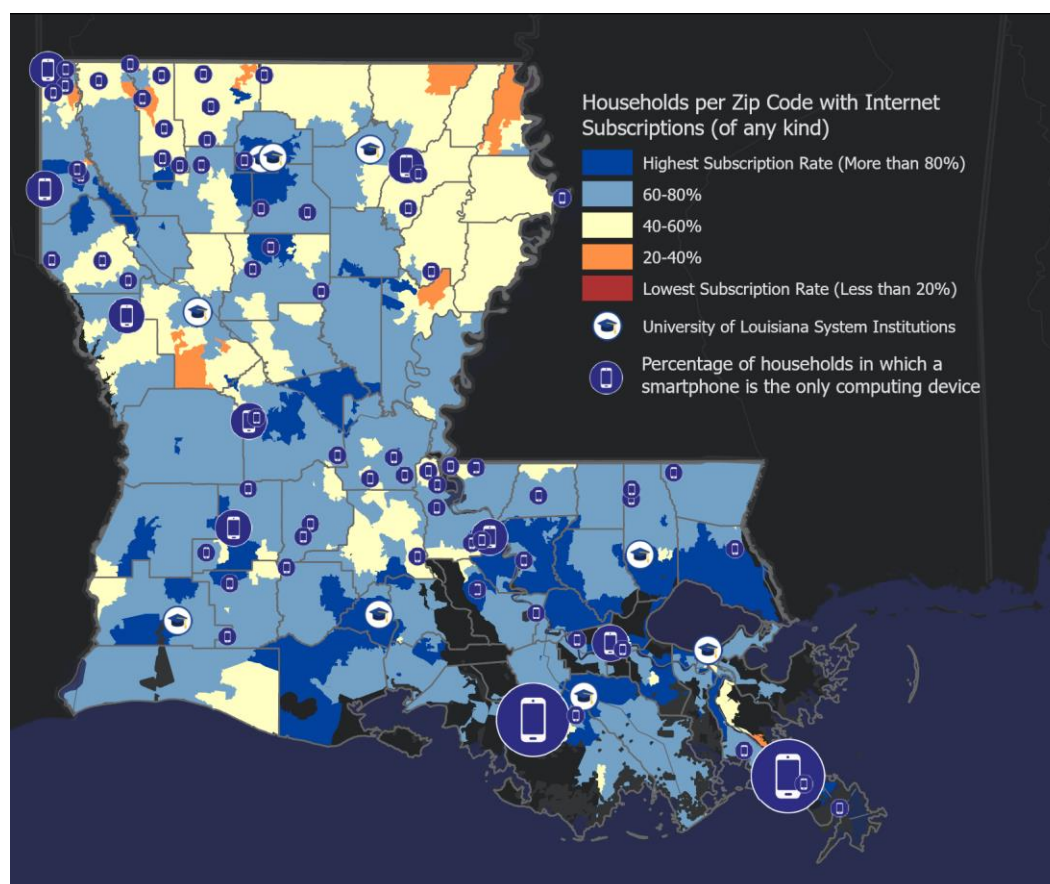
The type of technology used to access the Internet is important to determine as well. With smart devices readily available (smart phones/tablets/smart TVs/ etc.) it is important to consider Louisiana residents who may only have access to the Internet through a mobile device as well as those that do not have a computer in their homes. As established in Chapters 1 and 2, online programs have been identified as the preferred modality for higher education for the adult student population. Understanding the number of adults in Louisiana who are dependent on a mobile phone for access to the Internet and the number of adults that do not have computers in their homes become important factors as educators think about re-engaging adults to recruit back to higher education.

Figure 4-14 shows four different sized symbols of a circle with a slash through the center. The largest symbols represent that more than 80% of households within that zip code do not have a computer in their household. The second largest represents that 60%-80% of households within that zip code do not have a computer, the third 40%-60%, and the smallest sized symbol represents 20%-40% of households without a computer in their home. If Louisiana residents are not using computers in their homes, then a default computer device may be their mobile/cellular phone, many of which have capabilities for accessing the Internet through a mobile broadband cellular data plan. Figure 4-13 shows three different sized symbols (circle with a picture of a cell phone) in the center.

Figure 4-13*Households without Computers*

Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by United States Census block in Louisiana. Additionally, no computer symbols varying in size depict the percentage of households in which cellular data are the only Internet subscription by the United States Census Bureau. (U.S. Census Bureau, 2022)

The largest symbols represent more than 60% of households within that zip code that are dependent on a smartphone as their primary device to access the Internet (Figure 4-14). The second largest represents 40%-60% of households within that zip code do not have a computer, and the smallest sized symbol represents 20%-40% of households dependent on a smartphone as the only computing device in their home.

Figure 4-14*Households Where a Smartphone is the Only Computing Device*

Note. Each hue indicates the percentage of Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to the Internet by United States Census block in Louisiana. Additionally, cellular device symbols varying in size depict the percentage of households in which a smartphone is the only computing device by the United States Census Bureau (U.S. Census Bureau, 2022).

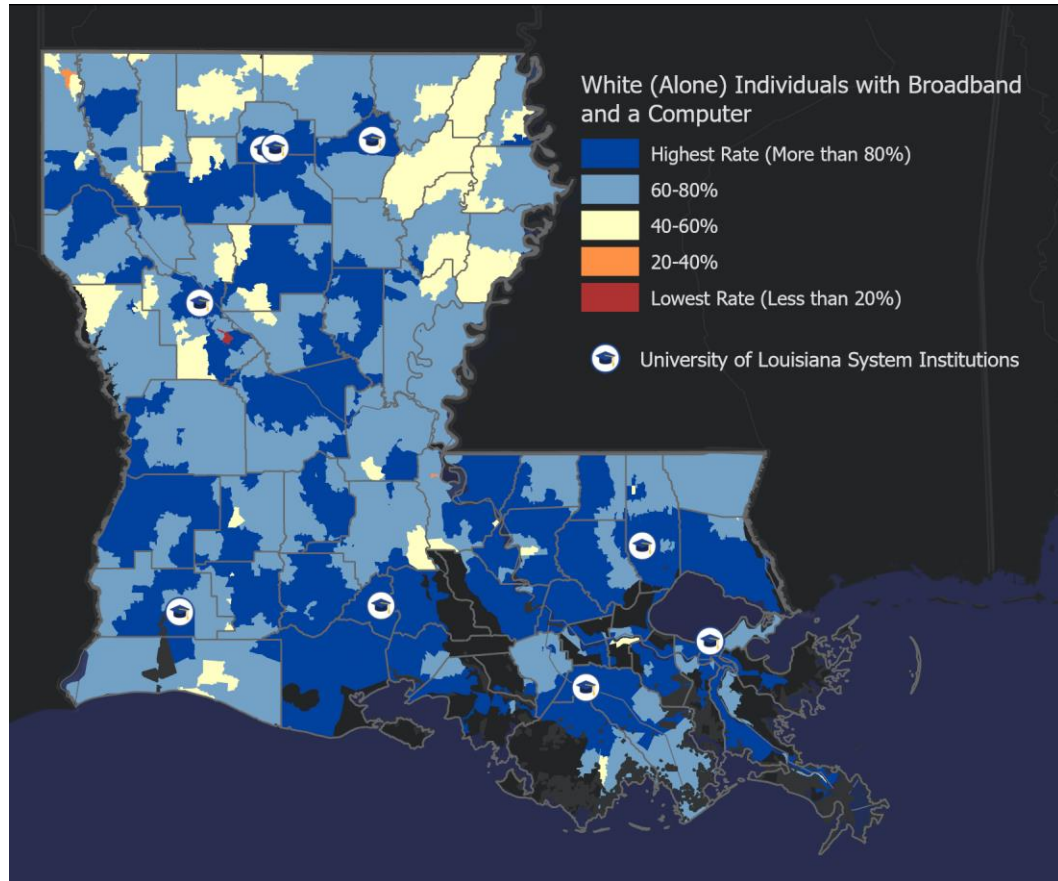
The largest symbols represent more than 60% of households within that zip code that are dependent on a smartphone as their primary device to access the Internet. The second largest represents 40%-60% of households within that zip code do not have a computer, and the smallest sized symbol represents 20%-40% of households dependent on a smartphone as the only computing device in their home. It has been established through Figures 4-10, 4-14, and 4-15 that mobile technology is an essential (and for many

only) modality for accessing the Internet. Exploring technology ownership between races was the next characteristic explored.

Figure 4-15 depicts the access that White Louisiana residents have to broadband Internet access and a computer. Conversely, Figure 4-16 depicts access that Non-white Louisiana residents have to broadband Internet access and a computer.

Figure 4-15

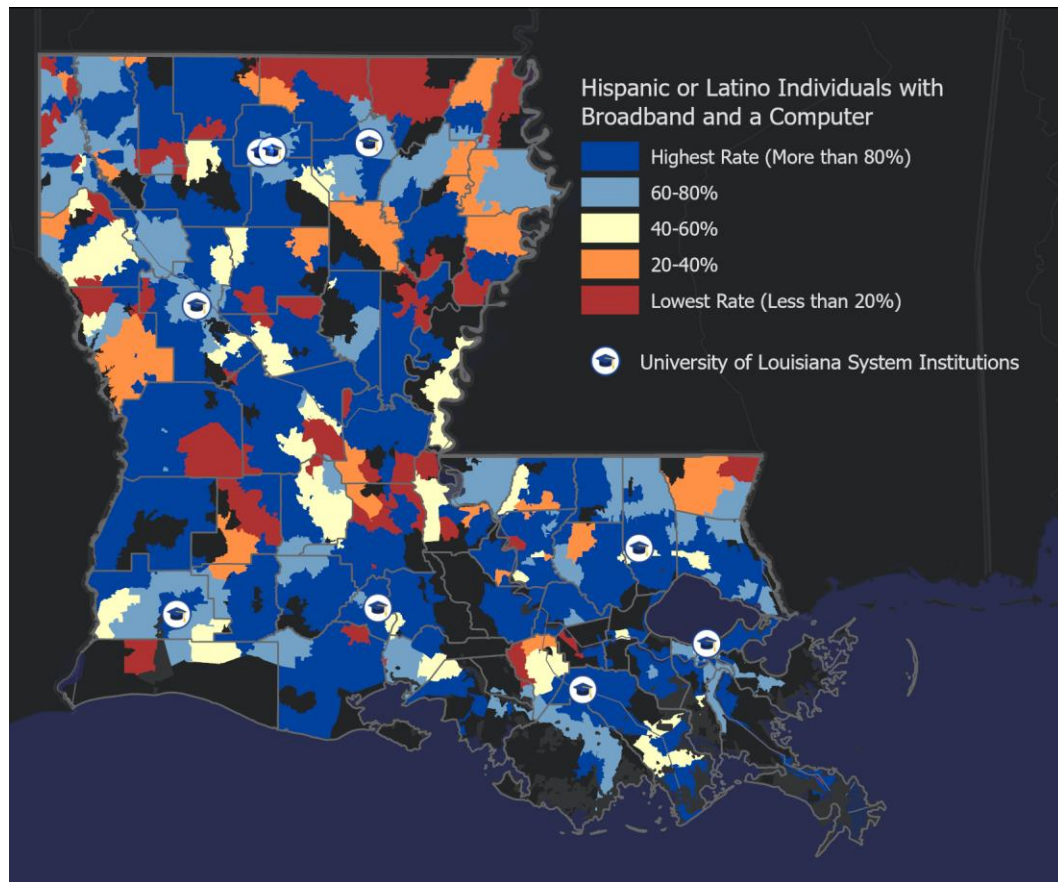
White Louisiana Residents with Broadband Internet Access and a Computer



Note. Each hue indicates the percentage of white Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to broadband Internet and a computer by United States Census block in Louisiana by the United States Census Bureau (U.S. Census Bureau, 2022).

Figure 4-16

Hispanic or Latino Louisiana Residents with Broadband Internet Access and a Computer



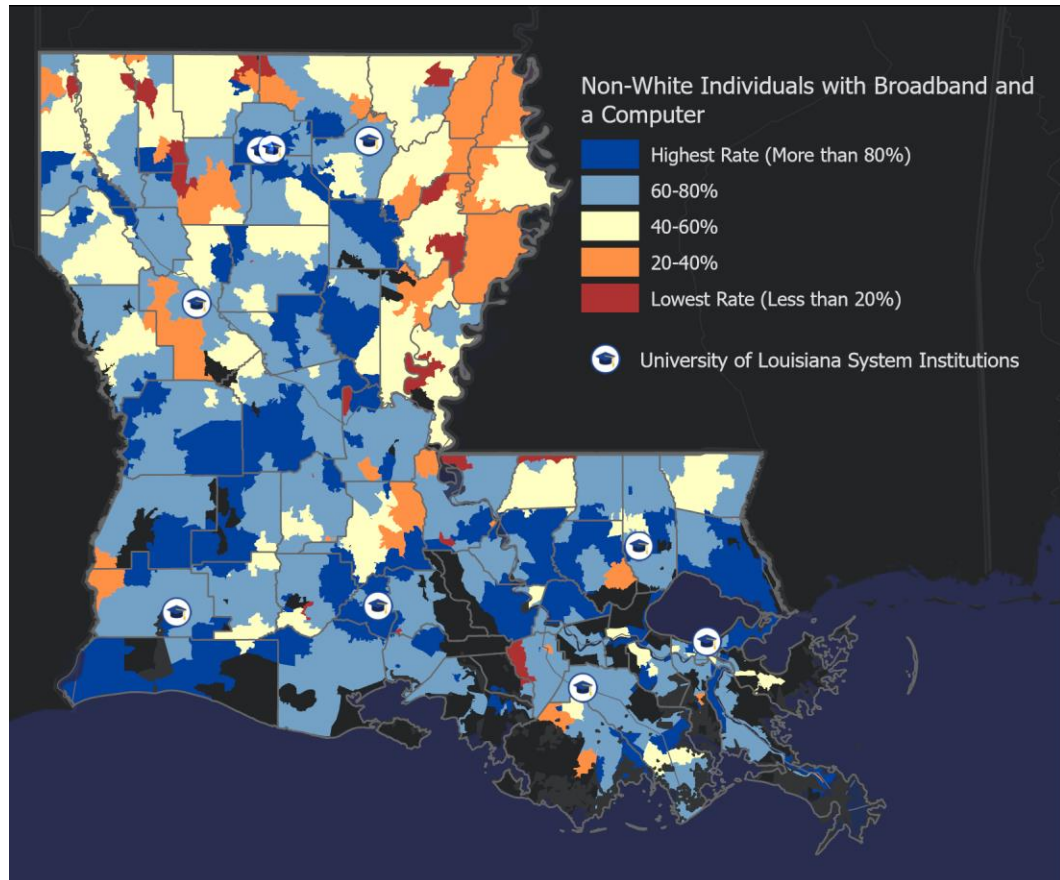
Note. Each hue indicates the percentage of Hispanic/Latino Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to broadband Internet and a computer by United States Census block in Louisiana by the United States Census Bureau (U.S. Census Bureau, 2022).

Figures 4-14, 4-15, and 4-16 depict the differences in three different races of Louisiana residents and their access to broadband Internet and computer hardware to access that Internet connection. What is clear from these maps are that disparities exist. White Louisiana residents who own a computer are more likely than not to have access to broadband Internet. Only one small geographic area in Figure 4-18 shows an orange area of access (20%-40% of residents within that area have access to broadband Internet and a

computer). In contrast, Figures 4-16 and 4-17 have varying levels of access to broadband Internet and a computer to use with that access.

Figure 4-17

Non-White Louisiana Residents with Broadband Internet Access and a Computer



Note. Each hue indicates the percentage of non-white Louisiana residents with some college experience, no bachelor's degree and their likelihood of having access to broadband Internet and a computer by United States Census block in Louisiana by the United States Census Bureau (U.S. Census Bureau, 2022).

CHAPTER 5

DISCUSSION

Introduction

Higher education is facing an enrollment crisis (Kline, 2019). For years, higher education administrators have been watching enrolment numbers decline for traditionally aged students (those 18-24-years-old). This enrollment cliff has been and will continue to impact first-time freshman enrollment numbers. To ensure that institutions of higher learning are able to continue operating at the scale they are currently serving, there is a need to expand their rates of adult student enrollment and retention. As explored throughout this research, there are a significant number of adults who have some college experience but no bachelor's degree. Re-engaging this population by helping these adult learners re-enroll and giving them support to matriculate through to graduation should be a focus for all higher education institutions. As discussed in Chapter 2, barriers to re-entry and matriculation are exacerbated for adult learners by the digital divide.

Adult learners face four main categories of barriers to re-entry and being retained to finish a degree: dispositional barriers; situational barriers; institutional barriers; and technological barriers. Dispositional barriers exist within the student: their self-doubts, their previous unsuccessful experiences, their beliefs that they are capable of balancing all of their other life responsibilities in addition to finishing a degree (Deggs, 2011).

These are barriers that higher education administrators, faculty, and staff should be aware of and proactively help students tackle when making leadership decisions.

Situational barriers are those life circumstances that can prevent a student from continuing or prioritizing her/his educational pursuits. Situational barriers can be happy life circumstances: marriages, babies, job opportunities. However, barriers can also be unfortunate life circumstances: health issues, deaths, job loss, financial difficulties (Osam et al., 2017; Roosmaa & Saar, 2016). Situational barriers are barriers that higher education administrators, faculty, and staff should be aware exist and proactively supporting students through these situations. Overcoming situational barriers requires higher education institutions to operate in a manner that serves students holistically.

Institutional barriers are the impediments that higher education institutions and administrators have created or perpetuated: policies, processes, and procedures that have been historically based in a focus towards engaging traditional, younger-aged students (18 – 24-year-olds) (Osam et al., 2017). Chen (2017) points out that the physical layout of the campus and university is designed with the younger population in mind. For instance, policies that require students to travel to campus to visit and physically sign a form are designed with the traditional on-campus student in mind. Many adult students do not have that type of flexibility with their schedules. Additionally, students in online programs expect to be able to complete any and all tasks associated with their education without having to come to campus to visit the campus. These rigidities often reside in all organizational branches of a university organization from admission or enrollment processes to course design and syllabi policies to faculty/staff-student interactions (Dawson et al., 2021).

Technological barriers are barriers that impact a student's ability to access and use technology in online course work (likely beginning with the admission/enrollment processes) as this study demonstrates. Technological barriers may be geographical in nature because the prospective adult student may not know where they can access the Internet. These barriers can be related to physical possession, as in not owning hardware/software to access the Internet or online course work. These barriers can also exist for students who have access to the Internet and the equipment to learn online (Deggs, 2011; Fetzer, 2013). Learning online is a great option, and clearly and based on literature discussed in Chapter 2, it has been supported as the best option for adults juggling multiple responsibilities. However, online learning may be problematic as it is a digital modality that differs from traditional classroom learning and may present challenges for an adult population that may not have experience learning online.

Digital literacy is a term used to describe the ability to use, find, evaluate, and communicate using digital technology (American Library Association, 2016). Digital literacy encompasses the use of technology itself as well as the appropriate way to critically evaluate resources and information found on the Internet. It also includes the skills to effectively and appropriately communicate using technology, and the appropriate etiquette (or *netiquette*) for interacting through digital spaces. Technological barriers are barriers that higher education administrators can address, but not without knowing the extent to which those barriers exist for potential students that halts progress in developing solutions to overcome those barriers.

Identifying the extent of digital access is the first step to understanding the landscape of the digital divide. This applied dissertation study shows the extent of the

digital divide in Louisiana and how it potentially impacts the hundreds of thousands of adults living in Louisiana with some college experience but no bachelor's degree. In order to best serve this adult student population, the models discussed in Chapter 4 can be used to develop a plan to strategically address technological connectivity barriers that may impede adult students' abilities to engage with higher education.

This study took an archival research methods approach and applied the ecological organizational theory of population ecology to understand the extent of the digital divide in Louisiana. Specifically, this research shows the impact that geographic location and certain socio-economic factors have on the potential adult student (specifically, adults with some college, no bachelor's degree) population in Louisiana. The approach of this study was to examine the extent of the digital divide through ecological modeling using maps created to model data collected by the United States Census Bureau's ACS and the FCC Form 477. Each data set was used to create maps that model the access to the Internet for Louisiana residents by specifically focusing on Internet availability and, where available, the type of Internet access.

Findings

Louisiana residents with some college experience but no bachelor's degrees are accessing the Internet through several different types of connections: cellular/mobile, broadband, satellite, fixed terrestrial, and fiber to name the most common modes. Use of cellular/mobile data plans are the most common way that Louisiana residents are connecting to the Internet. Broadband connectivity is not widely available in Louisiana; the FCC Form 477 showed that broadband access is not available throughout Louisiana. Louisiana residents who are accessing the Internet are most likely using a cellular/mobile

device to access the Internet. Geographic location does impact Louisiana the abilities of residents with some college experience but no bachelor's degrees to have access to the internet. Annual income and race seem to impact access to Internet connectivity. Louisiana residents who make less than the average Louisianan's annual income (\$49,469) are less likely to have access to the Internet than a Louisianan who makes more than the average annual income (U.S. Census Bureau, 2022).

This information can have a great bearing on higher education administrators' strategic planning to recruit and retain the latent adult learner population in Louisiana. This study gives context to the extent of the digital divide in Louisiana. Higher education leaders in Louisiana can use this information to ensure that colleges and universities are prepared to support the latent adult learner population living in Louisiana. This study highlights information about access to the Internet and shows that higher education leadership cannot assume adult students will be ready or equipped to learn through the Internet. Based on the maps created from the United States Census Bureau's ACS 2019 5-year estimates and the FCC's Form 477 from 2020, these are the answers to the research questions posed.

Research Question 1

Based on the data from the ACS 2019 5-year estimates and the FCC Form 477 providers, location proximity, and geography impact Louisiana residents' abilities to connect to the Internet. The lack of true broadband providers (who can maintain the speeds 25 Mbps down/3 Mbps up) is limited in many parts of the state, most especially in the center of the state and moving north as seen in Figure 4-12. This may lend a possible explanation as to why so many Louisiana residents are dependent on cellular data to

access the Internet (Figure 4-10 versus Figure 4-11). Information depicted on the maps show that access to the Internet is a factor that should be considered when colleges and universities put effort into attracting back and retaining adult students. Ideas to address this barrier will be addressed in later sections.

Research Question 2

ACS 2019 5-year estimates indicate socio-economic factors do have an impact on a Louisiana residents' abilities to access the Internet. The stark difference between the average income of a bachelor's degree holder in Louisiana and average income for a Louisianan (no educational attainment associated) and access to the Internet is striking. Information gleaned from these maps (Figures 4-7, 4-8, and 4-9) shows that an amount as low as \$549 may make a difference in the ability for a household to pay for an Internet subscription. Additionally, race (human construct) seemed to play a role in the likelihood of access (Figures 4-15, 4-16, and 4-17). White Louisiana residents were more likely to have access to the Internet than non-white Louisianans.

Educational attainment is an important factor in determining average income, earning a bachelor's degree is intrinsically linked to opportunities for income growth potential (Torpey, 2021). The maps provide a foundation to also argue that educational attainment also serves as a predictor of Internet and technology access. Figure 4-7 highlights the average income of a bachelor's degree holder in Louisiana showing that a large percentage of that population has access to (and technology to access) the Internet. Further socio-economic factors (dependents, employment status) could not be accurately compared with educational attainment information, and thus, analysis would detract from the intent of the question. There are opportunities to address this gap.

Research Question 3

This ACS survey data depicted in the maps and the information it highlights regarding the potential adult student population are crucial information for higher education administrators to understand, use, and apply. The information gleaned from the digital divide theoretical model, SATUM, about geo-social factors paired with the information from van Dijk's theory regarding socio-economic impacts on Internet access and use gives administrators a more accurate understanding of their potential student audience. To best serve student populations higher education administrators should be able to demonstrate an understanding of that populations wants and needs. The ability to understand the impact that technological factors play in perpetuating barriers to reentry and retention for adult students allows administrators and other higher education leaders and opportunity to address these digital inequities.

Discussion

Colleges and universities would benefit from an ecological organizational approach to reviewing how their current and potential student population are affected/impacted by the digital divide. The maps created as a result of this study are a resource that can be used by civic, state, and higher education leaders in the state of Louisiana to better understand the impact of the digital divide on the state's latent adult learner population. The maps show that varying socio-economic and geo-social characteristics as well as geographic location affect the latent adult learner population in Louisiana. Support for this potential student population must include scalable and sustainable solutions. Leadership should consider Park & Lek's (2015) Three Domains of Sustainability: economic, social, and environmental components. This study's research

suggests that those components are key to create sustainable planning and initiative implementation to impact three areas: economic, social, and environmental.

Adult students struggle with issues like how to pay college tuition and fees in addition to the resources or life changes that coincide with their decision to return to school. Costs associated with Internet access and the price for technology and maintenance may be an additional expense that the latent adult learner population may not be presently incurring. Additionally, adults often have other life responsibilities (work, family, community) that are impacted by their decision to pursue and finish a degree (Fogarty & Pete, 2004; Knowles, 1973; Zimke & Zimke, 1995). Re-enrolling and persisting are a significant time and financial commitments. When students make the decision to return to higher education, they are embracing disruption to their lives, routines, and finances.

Economic factors that impact access to the Internet and the technology used to access the Internet are centered in the concept of affordability. The economic factors (that already created potential barriers for adult students) are exacerbated by the digital divide, particularly those in lower income brackets (making below the annual income of a Louisianan with a bachelor's degree). Adults who return to higher education to finish a degree are faced with the question of affordability for both the traditional tuition and fee expenses, but also access to the Internet and technology to access online coursework. Resources and services that lower costs for students include loaner programs for technology (laptops, webcams, hot-spots), providing free or significantly discounted software packages (MS Office suite, access to research engines, Affordable/Open

Educational Resources [A/OER] in place of course textbooks or resources), and tutoring/orientations that address course content and digital literacy skills.

Addressing social factors is an important practice for growing student engagement as well as creating a sustainable adult student pipeline. Recognizing that adult students will need flexibility means accepting that the online course modality is the best option to re-engage adult students. Social connections between online students and their peers and faculty cannot be forsaken. Social components should emphasize interpersonal relationships and regular opportunities for communication throughout the student life-cycle.

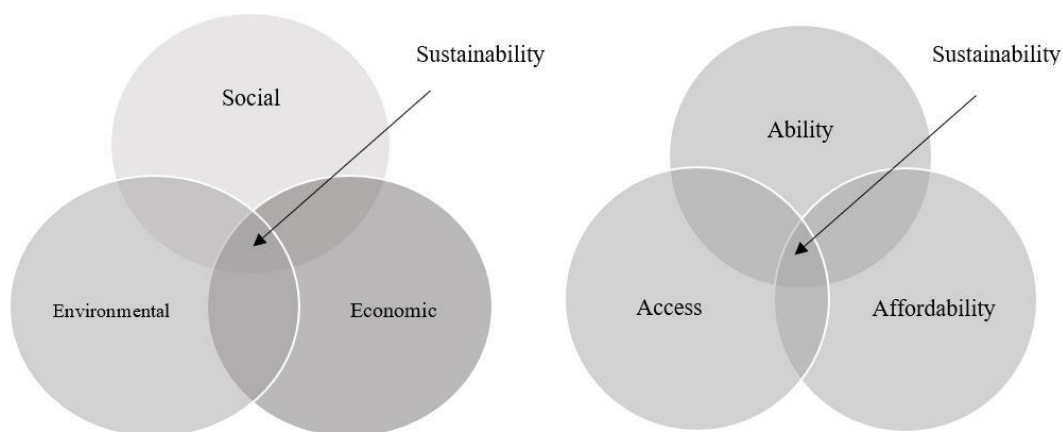
The maps created through this study show that adults with some college but no degree will have varying access to the Internet from their homes and may be likely to complete course work from a mobile device as a personal computer. Limited access or experience with technology or the Internet will affect an adult learner's success in the online classroom.

Environmental factors are the third component of creating sustainable solutions to serve an audience. Such factors include geographic and geo-social characteristics of the population as well as the environmental culture of the campus and learning environments. This study explored those geographic and geo-social factors that impact the latent adult learner population in Louisiana. Growing educational attainment in Louisiana will require higher education institutions to overcome geographic and geo-social characteristics or challenges to access that are exacerbated by the digital divide. Access is key to creating a sustainable environment to attract and support adults learning online.

Interpretations

Population ecology, an ecological organizational theory, is an approach to understanding first the big picture, or over-arching goal, and then narrowing layer by layer to understand the components that compose efforts to achieve the goal. The approach provides a framework to better understand the population the organization is serving, by examining components of diversity and difference as well as overarching commonalities and themes. Analysis includes both qualitative and quantitative data and then applies that data to forecast a predictable picture of the population and how its' anticipated changes will impact the services or goods of the organization. The research gathered through this study shows a connection between the digital divide and a college or university's ability to re-engage, recruit, admit, enroll, and retain a student who has prior higher education experience but was unsuccessful in completing a bachelor's degree previously.

Figure 5-1 demonstrates how the Three Domains of sustainability fit within the results of this study. Economic factors in this study may relate to the issues of affordability surrounding Internet connectivity. The Figures with income levels associated (Figures 4-6, 4-7, 4-8, and 4-9) show significant difference in access to the Internet across the population of Louisianans with some college but no bachelor's degree earned. Social factors in this study may relate to the issue of digital literacy or a student's ability to use computers and/or digital resources. Environmental factors can be interpreted as the ability to access the Internet and these factors may be physical location/geographic issues and/or availability of providers.

Figure 5-1*Three Domains of Sustainability Applied to the Digital Divide*

Note. The figures above highlight the Three Domains of Sustainability by Park & Lek (2015) as well as the researcher's interpretation of those elements as findings related to the digital divide and needs to be met to provide sustainability of access.

The figures above highlight the Three Domains of Sustainability by Park & Lek (2015) as well as the researcher's interpretation of those elements as findings related to the digital divide and needs to be met to provide sustainability of access.

Recommendations

In order for post-secondary institutions to be successful in these pursuits, the digital divide must be addressed. Addressing elements of the digital divide helps to address and lessen its effects on the potential adult learner population that has some college experience but lacks a bachelor's degree. The following sections describe recommendations to address each identified barrier for adults re-enrolling and persisting toward degree.

Higher education leaders should consider services and resources to reduce the financial burdens associated with re-enrolling and matriculating. Assumptions cannot be made about the savviness of adult students re-enrolling in online programs and thus when

higher education leaders think about creating social supports ability to use and navigate online courses and resources have to be considered. Administrators proactively upstanding digital literacy programming and support services are helping dismantle dispositional and situational barriers exacerbated by the digital divide. When applying the concept of the Three Domains of Sustainability, there seems to be a clear connection between the tenets of Park and Lek's (2015) model: social, environmental, and economic factors shown in Figure 5.1. The digital divide (Figure 5.1) can be conquered if *access* (environment) is available to Louisiana residents where they reside geographically, *ability* (social) is cultivated through social programming throughout the higher education curriculum, and *affordability* (economic) is tackled to offer Internet options that households at every median level of income (poverty included) can afford. The COVID-19 pandemic highlighted that the digital divide is more widespread and exists in more places than it does not. The use of ecological modeling through maps showed that both geographic and social factors contribute to a Louisiana residents place on the spectrum of the digital divide.

If higher education leaders can promote existing institutional resources for the digitally unconnected as well as ensuring that digital literacy concepts are embedded in curriculum and student services, then colleges and universities will see an increase in student re-enrollment and retention. Additionally, higher education leaders must be advocating for affordable wide-reaching Internet infrastructure. Identification and dismantlement of all four types of barriers (dispositional, situational, institutional, and technological) is critical to attracting and retaining adult students. Especially, when the barriers removed are tied to finances.

Addressing Dispositional Barriers

Dispositional barriers may be exacerbated by the digital divide. These are barriers that students may struggle with internally (mental and emotional). Students' beliefs in their abilities are paramount to their success in their course work. Exposure to the digital divide or lack of exposure, experience, or access to the Internet may impact student disposition. Although these barriers may be invisible to faculty and staff working with adult students, interventions throughout the student life-cycle can curb these barriers and provide tools for adult students to overcome their own challenges and anxieties. Interventions to address dispositional barriers can be proactively built to assist adult students through the student lifecycle.

Programming to bolster digital literacy may take the form of orientations, social media sessions, and drip communication campaigns that keep adult students engaged with the campus and/or set them up for online course success. Interventions that stress the use of communication can aid in relationship building with students, thus bolstering their ability to ask and receive help as well their belief in the fit of the institution to meet their needs.

Addressing Situational Barriers

Situational barriers are events in life that derail students from persisting towards degree. The digital divide may impact these barriers but how cannot always be predicted. Similar to dispositional barriers, situational barriers caused by or exacerbated by the digital divide may be addressed through outreach, intervention, and resource procurement.

Adult students are diverse and this study highlighted that in multiple ways. Interventions such as community partnerships, social services, and emergency relief resource offices can assist students with situational crises that arise. Higher education administrators cannot expect to solve every life situation that derails a student, but by building holistic student services and resources administrators may find that they have the ability to influence the severity of those situations and how they impact student persistence to degree. Providing options for resources to access the Internet (hardware like computers, webcams, and hotspots) or identification of free Internet sources (free public Wi-Fi) can provide students experiencing situational barriers caused by the digital divide some options toward solution.

Addressing Institutional Barriers

Institutional barriers are the barriers that higher education institutions unwittingly create that impede adult student re-entry and/or retention. The digital divide exacerbates institutional barriers as well and higher education administrators should be actively identifying those barriers and working to remedy them. Population ecological modeling calls for the evaluation and re-evaluation of processes, policies, and procedures. Regular review of practice, process, and policy is an organizationally healthy habit, and can aid in the identification and change in problematic institutional barriers.

Institutional barriers are in one aspect the easiest barriers for higher education administrators to identify but changing them may be much more difficult. Population ecology describes this phenomenon as the process of organizational ‘inertia’ (Hannan & Freeman, 1977, 1984). Inertia describes the multiple forces at play that either keep an organization moving in one direction or are used as a catalyst to move an organization a

new direction (Hannan & Freeman, 1977, 1984). In the world of higher education, inertia forces can be the different campus community groups (faculty, staff, executive administration, students, community, etc.); politics (campus, community, state, federal, etc.); tradition ('we've always done it this way'); money (funding, financing, budgets, etc.); and others. Often positive inertia (the kind of inertia that creates good change) requires tearing down silos and working across the institution to make changes to policy. Sometimes those changes have to be approved by the state; the university system; or an institutional or system governing board. This approach to evaluating institutional policies falls in line with the theoretical lenses used within this study.

The ecological organizational theory, population ecology, demonstrates how evaluations of processes as a whole and narrowing (or delimiting) to the issues that create hardship is an ecological organizational approach to change. Analysis means nothing without application; results from analysis of the population must be shared with all stakeholders to ensure campus community members understand the direction of the change. Creating a culture of inclusion will create the ability for faculty and staff to include (tying directly into the social components of the Three Domains of Sustainability – social, economic, and environmental).

The information gleaned from this study shows the impacts of the digital divide on a potential student population (adults with some college experience but no bachelor's degree). Higher education leadership in Louisiana can use this information to audit resources, services, and internal policies/processes that impact this potential student population. When policies/processes are not sufficiently addressing the barriers adult students encounter it will be up to higher education leadership to address those

inadequacies to better serve the adult student population. Additionally, if a lack of resources or services are determined to exacerbate barriers for adult students, administrators should seek solutions to provide or source those resources and services to minimize the effects of the barrier.

Addressing Technological Barriers

Technological barriers include two main concepts, access and ability. The digital divide is a concept that describes the inequities that exist in access to the Internet as well as the technology to use it. The digital divide also alludes to the concept of digital literacy, or how savvy a person is with using computer hardware and software and using/interpreting Internet resources (American Library Association, 2016).

Trying to understand the extent of the digital divide is challenging. Before the COVID-19 pandemic occurred, a majority of people working in higher education likely assumed that anyone who wanted access to the Internet had the access and the technology to access it. However, it did not take long for educators to realize how prevalent the digital divide is. Educators in Louisiana were scrambling to figure out which students, faculty, and staff lacked Internet resources or technology to access it from their homes. No visual resource existed to show geographically where Internet access existed, what types of Internet were available and used, or how the general public was accessing the Internet. Additionally, there were no reliable resources to find Internet access if someone needed it. Bridging resources to the populations most in need of them is a vital step in addressing barriers. This study used open data from the United States Census Bureau in the form of the ACS 2019 5-year estimates and visualized the data to create a model for

higher education administrators to use to address technological barriers for potential adult students.

The use of ecological modeling with the quantitative data from the ACS and FCC Form 477 created a compelling visual tool to understand the extent of the digital divide and the extent to which it exists in Louisiana. Additionally, data points shed light on potential barriers to re-entry and retention for adult students who have some college experience but lack a bachelor's degree. This approach was effective and provided visualizations to aid higher education administrators understanding of the potential student population, as well as context to how the digital divide affects potential adult students. It is clear that geographic location as well as socio-economic status will influence access and ability to use hardware, software, and the Internet proficiently.

Digital literacy is influenced by access, through these maps it can be gleaned that colleges and universities should be ready to serve these students through proactive interventions. Laptop and Internet hot-spot loaner, rental, or leasing programs should be available at colleges and universities, as well as marketed to students who may not have access. Additionally, digital literacy components should be included in orientations, course syllabi and policies, and embedded throughout the curriculum. A study by Chaffin and Harlow (2005) points to the cognitive ability and adaptiveness to technology found in older adults. The study highlighted that when technology serves as a bridge to information and social relationships it is not only something that can be learned at any age, but also learned as quickly as the student is motivated to learn (Chaffin & Harlow, 2005). Bridges to community and public resources should be available to faculty, staff, and students. By marketing these resources, colleges and universities will create an

environment that empowers faculty and staff to connect students with tools for success overcoming technological barriers.

Future Research

A continuation or replication of this study is recommended. As mentioned throughout the study, the data set used for the maps created for the ecological modeling are now outdated. Analyzing the latest ACS data for the same characteristics and seeing how and where changes occurred could give direction for future interventions that help adults overcome barriers to re-entry and matriculation. These interventions could be from higher education institutions through initiatives and proactive actions as outlined above, or they could be from public/private expansion of Internet resources. The ecological modeling method could be duplicated by other higher education state agencies to inform higher education practice for other state public/private higher education institutions.

A recommendation to state and federal governing bodies is the development of a survey tool that could examine a larger percentage of populations across the United States, to truly understand the extent of the digital divide. An area for future development is the creation of a first-person survey tool that could be distributed to every individual living within a census block. ACS questions could be included in the ten-year census surveys.

Higher education professionals must continue to track and understand the re-enrollment and retention of adult students to discover barriers that prevent adult students from re-enrolling and matriculating. Addressing barriers as they are discovered is key to converting inquiries into enrollments. These barriers will continue to change as the adult student population changes, thus warranting more research. Higher education

administrators should continuously review processes, procedures, and curriculum to ensure that adult student needs are met just as they do for the traditional student population.

It is imperative that higher education administrators track, understand, and create interventions to attract, admit, enroll, and retain adult students that may struggle with digital access and/or digital literacy. Interventions to overcome adult student barriers should be created, documented, tracked, and shared between higher education professionals. By sharing information, higher education administrators would strengthen the structure of the academy in a way that supports students in a holistic nature. The current political, geothermal, social, judicial, and economic climates are changing, perhaps deteriorating at a pace that has negatively impacted the globe. Higher education institutions have to change, shift, and grow to meet their ever-evolving constituents.

Conclusion

Universities and colleges have focused on traditionally aged 18-24-year-old students to the detriment of attracting and serving adults that have some college experience but lack bachelor's degrees. Higher education administrators focus must expand to include the large latent adult learner population that exists. Louisiana is just one state with this issue; it may be a state with an exacerbated latent adult learner population, but it is not a problem unique to Louisiana. Aslanian and Fischer (2022) point out that that adult student population is an opportunity for all higher education institutions, not just an opportunity for one geographic region. Striking a balance between anticipating and accommodating economic, social, and environmental factors that can negatively impact current and potential adult students is the key to creating sustainable

programming and services. Creating sustainable programming and services begins by identifying and understanding barriers to adult enrollment and matriculation.

There are four distinct types of barriers that affect the adult student population: dispositional, situational, institutional, and technological. These barriers may all intersect with economic, social, and environmental factors. Understanding these barriers can aid higher education administrators in creating interventions, resources, and reviews of processes, policies, and procedures for opportunities to overcome barriers for adult students.

The digital divide is a concept that must be understood by higher education administrators and communities. The effects of the digital divide are widespread and relate to someone's ability to access the Internet and/or technology and their ability to use technology (hardware/software) and navigate the Internet with savvy. Even as technology has become more widespread, there are still many parts of the state of Louisiana where it is not available. Large swaths of the state are dependent on cellular data plans to connect to the Internet. Those Louisiana residents are either living somewhere geographically disconnected from broadband resources, or they potentially lack the financial resources to pay for access and/or technology to access the Internet.

When comparing Internet subscriptions among households based on ACS data for median household income, it was startling to see the stark difference between the median household income of a bachelor's degree holder (\$50,018) and the median household income of a Louisianan with no minimum educational attainment (\$49,469) made such a large difference in the percentage of households with Internet subscriptions across the state. The difference between the two median incomes was roughly \$549, which if

divided by 12 would amount to \$45.75, roughly the price of a cellular data plan inclusive of Internet access or the lowest priced broadband Internet plan available through a broadband provider. Additionally, it was interesting to visualize the number of households without a computer and those dependent on a cellular device as the only means to access the Internet. Clearly, the digital divide exists in Louisiana and will impact adult students and potential adult students who need online programs (because of the flexibility) to finish a bachelor's degree.

Understanding the extent of the digital divide and the impacts it can have on current and potential adult student digital literacy should inform higher education recruitment and retention plans. This information gives higher education administrators direction to establish interventions and resources to address these technological barriers. A similarly designed study could be designed to help inform on the three other types of barriers that interrupt student progression towards a degree.

Implementing changes to processes, policies, and/or procedures or establishing new resources or interventions can be difficult to implement. Change has a better opportunity to occur if communication is clear and campus communities can collaborate to serve students with appropriate right-time interventions. By creating channels for an exchange of information and encouragement of collaboration relating to the digital divide, faculty and staff may start their own evaluations and adjustments of their processes, procedures, and policies to serve adult students.

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