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Quantitative study on the efficacy of online and hybrid learning formats as related to the success indicators of equity

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A QUANTITATIVE STUDY ON THE EFFICACY OF ONLINE AND HYBRID LEARNING

FORMATS AS RELATED TO THE SUCCESS INDICATORS OF EQUITY

A dissertation submitted in partial satisfaction

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by

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DOCTOR OF EDUCATION

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DEDICATION

This dissertation is dedicated to my children, Kayvon and Kaveh,

and my wife, Dr. Yasaman Mostajeran.

ACKNOWLEDGEMENTS

VITA

Professor Ali Kowsari has held positions as Co-Chair and Associate Professor of Global Business and Entrepreneurship at Santa Ana College and is an award-winning Adjunct Professor of Graduate and Undergraduate programs of International Business and Marketing at the California Polytechnic in Pomona and California State University of Long Beach. He has previously served as the International Trade Specialist with the Rancho Santiago Center for International Trade Development (CITD), and the Chairman and CEO of Namvers, Inc., a global trade company.

As an educator and executive, Ali has over 22 years of experience in international consulting, sales, marketing, and education (as of the time of this document). In the past decades, he has launched international trade and import/export companies, and has helped many start-ups, as well as small and medium sized companies, to go global.

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ABSTRACT

This research involved a quantitative secondary analysis using the Integrated Postsecondary

Education Data System (IPEDS) to investigate factors leading to disparities in academic success.

Focusing on the role of course modality, the research aimed to address the need to enhance

equity in academic achievement, considering age, gender, race, and socioeconomic status.

Special attention was given to online and hybrid modalities from 2017 to 2021, encompassing

both pre- and post-pandemic data to observe shifts in higher education to more online and hybrid

practices. The research was rooted in Astin's student involvement theory and Rawls' theory of

justice, and it sought to discover paths to educational equity. Multilevel secondary analyses

revealed significant variations in academic success measures across different demographic

groups over time, with some demographics showing moderate improvements. These findings

indicated that although improvements have been realized among many groups, the magnitude

and consistency of these changes vary considerably across different demographic groups. The

analysis revealed statistically significant changes in the number of programs offered, both

online/hybrid and face-to-face, and for specific degree programs across the years. The effect

sizes for these changes ranged from small to moderate, indicating varying levels of impact over

time. The conclusion is that although the adoption of online and hybrid instructional methods has

yielded positive results in student engagement, satisfaction, and overall success, persistent racial

and ethnic disparities remain. Online and hybrid formats have led to improvements in academic

success across different gender categories, but gender disparities persist. Findings also

demonstrate that both student demographics and instructional modalities play significant roles in

shaping individuals' academic experiences, highlighting the complexity of factors influencing

academic success. Recommendations for practice include improving online and hybrid education

through interactive activities and diversifying instructional practices. There is a need to address race, ethnic, and gender disparities with culturally responsive teaching and tailored support to meet the diverse needs of this student population. Further research is needed to investigate the underlying factors contributing to race and ethnic-based disparities in online and hybrid learning environments, such as access to technology, cultural responsiveness, and systemic barriers.

Keywords: quantitative secondary analysis, academic success, course modality, equity in education, online and hybrid learning, demographic disparities, access to technology

Chapter One: Study Introduction

Overview

Educating the young generation has been a major concern over the years. Most of the research on the academic achievement of students has been focused on teaching strategies, the need for teachers to take into account their teaching strategies as well as assessment tactics for developmental models (Baldock et al., 2021). According to O'Keefe et al. (2020), teachers have to align their pedagogy strategies to the developmental needs of the children. Additionally, teachers need to utilize pedagogy models that address the needs for student achievement by engaging in collaborative reflections to attain augmented levels of student achievement and development (Audu et al., 2017). Academic achievement and success are interchangeably used in educational environments in reference to student outcomes. The term academic achievement refers to measurable educational outcomes based on criteria such as grades, test scores, course completion, and mastery level of subject matter. However, academic success extends beyond the grades and test scores and includes a wider range of outcomes such as personal growth, contribution to research, intellectual development, and societal impact.

Collaborations that are associated with professional learning teams are essential in enabling instructors to utilize expert perspectives that are based on divergent theories. As observed by Viljoen et al. (2017), when teachers work jointly with policymakers by implementing research-based knowledge, they can accelerate rigorous teaching strategies due to the component of sharing ideas. Expounding on this point of view, Baldock et al. (2021) indicated that sharing of ideas enables teachers to focus their instructional strategies on feedback from students instead of blindly applying interpreted inferences that are based on research evidence (Audu et al., 2017). This explains why research discourses have shifted from

perspectives that are based on modalities of teacher-centeredness to modalities that are based on student-based evidence.

Technological advances have significantly influenced instructional strategies in education settings. As such, communication systems enhancements have been increasingly focused on addressing the needs of learners and instructors both in private entities and education institutions (Ayob et al., 2020). However, concerns have arisen in relation to the utilization of technologies in the education sector. For instance, Ayob et al. (2020) indicated that scholars are increasingly concerned about technological efficiencies in delivering the required educational content. Consequently, researchers have been increasingly focusing on novel ways of merging technology with the diverse needs of students at different learning levels amidst the evolving instructional methods. On the same note, researchers have indicated the need for blending learning and teaching approaches to generate a more effective method of providing student instruction to improve academic achievement among modern-day students (Paulsen & McCormick, 2020; Sellami et al., 2017).

Amidst the in-person, online, and hybrid instructional modalities, demographic factors have also been found to influence the academic achievement of students. As pointed out by Paulsen and McCormick (2020), students' characteristics, including gender, age, socio-economic status, generational status, and race, are among the most significant factors influencing academic performance. Affirming this point of view, Altindag et al. (2021) undertook a study in which they investigated academic performance in relation to demographic factors. Particularly, the researcher considered gender, race, and student status and discovered that academic performance was significantly related to each of the three factors. In a separate study, Paul and Jefferson (2019) undertook a correlative study in which they considered variables such as academic

performance, race, and gender. Findings obtained from the study revealed significant differences in academic performance based on the components of gender and race.

Notably, researchers have previously undertaken to explore learning outcomes in relation to instructional conditions encompassed in online and face-to-face instruction, but minimal efforts have been focused on exploring how the mode of instruction and demographic factors impact various metrics of student success (Rogowsky et al., 2020). Such observations explain why researchers have been increasingly focused on determining the effectiveness of online and face-to-face instruction delivery modalities in attempting to address learning and teaching challenges associated with the modalities relative to the need to augment equity in learning outcomes.

Online instruction has been said to have originated from the conception of distance learning. On the same note, Maramag-Manalastas and Batang (2018) held the opinion that distance education led to the emergence of online learning because of the emergence and continuous usage of broadcasting systems, web-based instructional modes through teleconferencing, and online canvas instruction. Undeniably, online instruction has been enhanced by the need to reach diverse populations regardless of their geographical location due to the need to foster equitable global access to education opportunities (Audu et al., 2017; Sellami et al., 2017; Viljoen et al., 2017). Such a perspective would explain why researchers have increasingly advocated for the use of online instructional modalities to improve learning experiences, especially for distance learners, while allowing other learners to enjoy the advantages associated with online learning (Audu et al., 2017). Moreover, online instruction modality has become a modality of preference given that it addresses issues that are associated with place as well as time constraints, which, as indicated by Paul and Jefferson (2019), have to

be addressed to improve learner flexibility and, consequently, learning experiences. Additionally, online instruction modalities provide opportunities for learners to exert control over their path in the course of the learning process (Altindag et al., 2021; Viljoen et al., 2017).

Online instruction has been associated with significant and numerous advantages owing to its features that offer flexibility to learners. On the other hand, it is critical to recognize that instructional modality has also been linked with demerits, such as reduced learner engagement and low motivation levels (Altindag et al., 2021; Ayob et al., 2020). Learners have also reported issues that impede academic achievement when online instruction modalities are used extensively. Some of the issues highlighted by learners include the lack of belongingness and disengagement from other learners based on race, age, and gender, which causes students to feel isolated and eventually negatively impacts their academic achievement (Sellami et al., 2017). Such a point of view would explain why O'Keefe et al. (2020) argued that instructors have to take into account demographic factors while utilizing online instructional modalities to create inclusive learning environments that reduce the negative influences of demographic factors on student achievement.

The digital divide in education presents disparities in access to internet connectivity and technology among students and has a direct influence on their ability to effectively engage in online or hybrid learning modalities (Norman et al., 22022). The disparity in students' access to online and hybrid learning has exacerbated existing inequities, further broadening the gap in educational achievements between students from distinct socioeconomic backgrounds. Hass et al. (2023) acknowledged that the digital divide, which is associated with the varying socio-economic status of students, contributes to educational inequalities in the wake of the increasing adoption of online and hybrid learning modalities. These authors emphasized the need to address

the digital divide as a way of ensuring that all students from diverse socio-economic backgrounds have equal access to the digital resources needed to thrive in these learning environments. These authors called for the exploration of relevant strategies and policies that can reduce the digital divide to promote an educational landscape that supports inclusivity and equity for the academic success of students.

Blended instruction, as indicated by Paul and Jefferson (2019), refers to a style of education in which students learn via electronic and online media as well as traditional face-to-face teaching. Additionally, blended instruction has proven expedient in helping learners reap benefits associated with geographical locations and time (O'Keefe et al., 2020). As such, one of the chief advantages of utilizing blended, otherwise known as hybrid instruction, is that instructors can leverage the component of delivery sequencing, thereby augmenting satisfaction among learners and helping them achieve better academic success measures (Baldock et al., 2021; O'Keefe et al., 2020; Sellami et al., 2017). When it comes to the specificity of patterns associated with blended/hybrid instructional modalities, several components have been suggested as being effective in enhancing academic achievement among students. These constitute learning in both online and offline modes, custom content, collaborative learning (Audu et al., 2017; O'Keefe et al., 2020; Sellami et al., 2017), structured/ unstructured learning, (Paul & Jefferson, 2019), work and learning, and synchronous /asynchronous formats (Audu et al., 2017).

The rationale for blended instruction has also been provided in relation to academic achievement and equity in academic success measures, even amidst prevailing demographic factors. Some justifications constitute enhanced knowledge access, augmented learner interaction and sharing of ideas (Viljoen et al., 2017), and ease of revision relative to available learning content (Sellami et al., 2017). Nonetheless, none of these reasons touch on the issue of equity in

student outcomes. However, researchers have seldom embarked on exploring the different online and blended instructional modes relative to equity in academic achievement learning in light of demographic factors like age, gender, and race by taking into account instructional satisfaction and learning involvement and motivation (Audu et al., 2017). Additionally, few studies have been conducted to identify the differences in learners' learning application between online and blended learning environments from a perspective informed by inequities in student academic achievement.

Home learning may, due to uncontrollable circumstances, have initially instigated an initial widening of the attainment gap. However, this does not mean it is not a worthwhile endeavor. According to Paul and Jefferson (2019), when implemented correctly, remote learning could be a dynamic and worthwhile companion to traditional classroom education. Such a point of view would explain why Altindag et al. (2021) noted that a hybrid or blended approach of the two (remote and traditional learning) would make the most of teachers who have developed strong digital literacy through experience while simultaneously maintaining their ability to keep students engaged with their learning. Additionally, blended learning has been extensively advocated owing to its ability to provide an opportunity for students to increase their own stake in their education. Moreover, Boonk et al. (2018) noted that blended instruction is advantageous, given that adopting digital aspects into the curriculum will allow students to work at their own pace through certain topics. Affirming that blended learning is associated with significant advantages, S. Maxwell, Reynolds, et al. (2017) stated that traditional classroom learning moves at one speed, which risks leaving some behind. Further, Paul and Jefferson (2019) stated that traditional learning is limited, especially in cases of student absence, a lapse in student engagement, and simple miscomprehension results in a student failing to learn fundamental

elements of the curriculum, eventually exerting significant negative influences on student in the future. These disadvantages can be overcome by using blended instructional modalities since the use of digital tools will make it easier for teachers to identify and consequently rectify the area where a pupil is stuck (Boonk et al., 2018).

Problem Statement

The research problem analyzed in this study was the inequities in education, which adversely affect the success rates among students in higher education, especially those in community colleges. A problem exists in higher education where, despite significant improvement in blended and online learning modes, students from vulnerable groups face persistent barriers to attaining academic success (Castelli & Sarvary, 2021; Joosten & Cusatis, 2020; Mishra, 2020). The efforts by stakeholders in the education sector to address these challenges have fallen short, resulting in continued disparities in student outcomes (Castelli & Sarvary, 2021; de Brey et al., 2019; Mishra, 2020). The persistence of this problem is adversely affecting students from equity groups, which comprise vulnerable demographics, as they struggle to achieve equitable academic success in the wake of disparities in educational environments and instructional approaches (Amaral, 2022; Ancheta, 2022; Avazmatova, 2020; Ayob et al., 2020). Demographic factors such as age, gender, race, and socioeconomic status, as measured by financial aid, have significantly impacted student achievements by perpetuating inequalities in educational outcomes (Chaudhary, 2017; Ellsworth et al., 2022; Jones et al., 2020; S. Maxwell, Reynolds, et al., 2017). The persistent disparities in academic achievements, particularly in online and blended education (Daud et al., 2021; Joosten & Cusatis, 2020; S. Maxwell, Reynolds, et al., 2017), calls for an urgent need to explore the specific role and efficacy of online and blended instructional modalities in mitigating and exacerbating these inequities. In

addressing the problem of disparities, the present study sought to investigate the trends in academic success measures among equity groups within the IPEDS dataset from 2017 to 2021. The researcher sought to investigate how demographic variables such as age, gender, race, and socioeconomic status intersect with instructional modalities (online, blended) to impact student success. The choice of quantitative secondary analysis in this research provided insights into prospective solutions to rectify equity issues in academic achievements, eventually striving for a more equitable higher education landscape.

Purpose of Research

The purpose of this quantitative, Secondary Analysis study was to identify factors associated with inequities in success measure scores by equity group within the United States postsecondary education system. The secondary analysis design involves using data that was collected by another party (Gray, 2021). Additionally, Trochim (2006) noted that secondary data may be primary data for the original researcher and only becomes secondary data when it is repurposed for a new task. In this study, the researcher used IPEDS 2017 – 2021 data. An additional aim of this study was to investigate the role of course modality in relation to academic success measures. To achieve this objective, the researcher focused on unearthing how the mode of instruction and demographic factors impact various metrics of student success. As indicated by Chaudhary (2017), demographic factors such as age, gender, and race have been found to influence the academic achievement of students, leading to inequalities in student outcomes. Moreover, S. Maxwell, Reynolds, et al. (2017) indicated that the in-person, online, and hybrid instructional modalities, apart from having different influences with regard to student achievement, have been associated with inequalities in matters related to student outcomes.

Existing data were sourced from the Integrated Postsecondary Education Data System (IPEDS), which is compiled by the National Center for Education Statistics (NCES, 2022). NCES is the primary federal entity for collecting and analyzing data related to education in the U.S. and other nations and fulfills a Congressional mandate to collect, collate, analyze, and report complete statistics on the condition of American education; conduct and publish reports, and review and report on education activities internationally (NCES, 2023). The IPEDS is the primary source of information on United States universities and colleges, as well as other postsecondary education institutions such as vocational and technical training institutions. IPEDS includes a series of surveys answered by postsecondary institutions on education success metrics, including enrollment data, retention rates, graduation rates, and degrees awarded in every significant ranking and accreditation. The IPEDS scores are a significant factor that students consider when choosing colleges and universities. In addition, the scores significantly influence policy interventions by the United States Education Department.

The acquired IPEDS data were then subjected to a multi-level analysis. During the analysis process, the researcher considered demographic variables (gender, age, income, and race), the program type (associates, bachelor, and certificates), and modality (online, in-person (face to face), and blended learning/hybrid). In the analysis, the focus was to determine the role of demographic variables and modality as related to academic success measures.

Additionally, the researcher relied on the quantitative methodology to analyze the trends in success measure scores by equity group within the IPEDS 2017 – 2021 data by taking into account the role of course modality in relation to success measure scores. Given that the research objective was concerned with real-world happenings that are related to academic achievement among students in light of the different instruction modalities and the demographic factors of

age, gender, and race, the secondary analysis approach helped unearth existing trends related to the phenomenon under study (Gray, 2021) by using IPEDS 2017 – 2021 data.

Epistemological assumptions, from which quantitative research derives, hold that there is an objective, logically organized world that is distinct from both the researchers' and the participants' views (Creswell & Poth, 2018). As a result, quantitative research adopts an etic perspective in epistemology, where researchers are independent of the subject being studied. In other words, they cannot affect or be affected by the subject of the investigation to determine the objectively measured truth. In contrast to quantitative research, which adopts a positivist epistemology, qualitative research adopts an emic approach where interactions between participants or the subject of the study are seen as essential to gaining a thorough understanding (Creswell & Poth, 2018). Under epistemological assumptions, people can only understand reality through their views and interpretations because it is mind-dependent and socially produced.

Under the axiological assumptions, the worldviews of the researchers have an impact on the types of questions posed. The values, life experiences, and worldviews of the researchers also have an impact on how they analyze the findings and extrapolate the themes (Creswell & Poth, 2018). The participants' values, experiences, and worldviews interact with the researchers to further the analysis at the same time.

Research Questions

The study was guided by the following research questions.

- RQ1: What are the trends in academic success measures by equity groups within the IPEDS 2017 – 2021 data?

- RQ2: What, if any, statistically significant relationships exist between demographic and teaching modality variables?

Conceptual/Theoretical Focus

The researcher's efforts focused on three key constructs. These were academic achievement, equity, and instructional modalities. Academic achievement is critical because students, after graduation, are expected to develop into leaders as well as resources that propel their families, communities, and countries to higher echelons of economic prosperity (Boonk et al., 2018; H. Lei et al., 2018). Moreover, Boonk et al. (2018) stated that learner factors that could impact academic achievement include the gender of students, family background, education-associated aspirations, and motivation to pursue education. Curriculum factors have also been cited as being able to determine students' academic achievement. Such factors include teaching strategies, the class atmosphere felt by students, class size, and teacher support for student learning (Altindag et al., 2021). Factors at the school level that influence academic achievement include institutional management, teaching staff competence, school culture, and class practices (Altindag et al., 2021; Rogowsky et al., 2020). Nevertheless, other studies have also measured the factors that affect academic achievement, including demographic information such as gender, age of race, ethnicity, and family backdrops (H. Lei et al., 2018).

Social justice is an important concept regarding academic achievement. In terms of social and economic institutions, the social justice principle is as follows: Economic and social disparities must meet two requirements (Mishra, 2020). Equality was also the focus of the social justice principle. Rawls concluded that social inequality could not be prevented. A person's socioeconomic class, personal motivation, genetic traits, and even luck can all contribute to inequality (Joseph, 2020). Rawls affirmed that a just society should seek out ways to lessen inequality (J. Rawls, 1971). According to J. Rawls (1971), the basic structure of society is the primary subject of justice, which influences an individual's life prospects. This structure is

composed of legal, economic, social, and political institutions (J. Rawls, 1971). Eliminating

discrimination would be one method for society to achieve justice from the basic structure

perspective (J. Rawls, 1971). Another strategy for promoting social justice would be to make

education accessible (Mishra, 2020).

Instructional modalities have been deemed critical in that they provide learners with

information that is essential in helping them come up with academic expectations, which in turn

determine their academic achievement (Baldock et al., 2021; O'Keefe et al., 2020). Further, the

appropriate usage of instructional modalities offers students the ability to provide timely and

accurate reports of instruction delivery approaches, which in turn helps teachers to improve

pedagogy approaches utilized to enhance academic achievement (Baldock et al., 2021). When it

comes to in-personal instructional approaches, instructors are required to administer services to

students within the campus premises. According to Baldock et al. (2021), this instructional

modality necessitated that students attend classes in physical campus environments as well as

utilize canvas-provided avenues during scheduled and regular learning intervals. On the other

hand, the blended course instructional modality is deployed in such a manner that students partly

learn in physical classroom environments and partly through online instruction (O'Keefe et al.,

2020). There also exist online asynchronous courses whereby more than 50% of the learning

takes place through an online format (O'Keefe et al., 2020). As indicated by Baldock et al.

(2021), under this modality, students are not required to attend class at scheduled times but rather

to engage in independent learning activities and assignments in Canvas per course instructions.

The online synchronous mode of instruction is quite different. As indicated by Ayob et al.

(2020), students receive more than 50% of their instructions online and have to interact with the

instructor and other students while utilizing online platforms to engage in learning activities that

are relevant to their specific courses. Finally, there is the distance learning instructional modality in which video conference technology has continued to facilitate off-site interactions between students and instructors through text, audio, and video facilities (Altindag et al., 2021; Baldock et al., 2021; Paulsen & McCormick, 2020).

Definitions

Academic Achievement- Theoretically, academic achievement refers to performance representations exemplifying the degree to which an individual has attained particular objectives that were designed to be achieved by being part of instructional environments availed by campuses (Sellami et al., 2017). It is operationalized as educational outcomes measured on criteria such as grades, test scores, course completion, and mastery level of subject matter. Grades and test scores are common measures of academic achievement. IPEDS measures academic achievement in terms of the number of degrees awarded, rates of college retention, graduation, rate of college placement, and rate of transfer out. The majority of educational leadership techniques take into account the idea that educational challenges are positioned in a larger societal context to effectively address the diversity of today's students and communities, as well as to demonstrate and model what the community desires and values (H. Lei et al., 2018).

Academic outcomes or success - The academic outcome/success is an assessment of student's academic performance based on their institutions' projections (Sellami et al., 2017). Academic success captures grades and test scores as well as a wider range of outcomes such as personal growth, contribution to research, intellectual development, and societal impact. Academic success is a continuous variable measured by the completion or graduation rates of academic programs. Similar to academic achievement, IPEDS defines academic success in terms

of degrees awarded, rates of college retention, rate of graduation, and college placement (NCES, 2022).

     Associate program- An associate's degree is an academic program taken at the undergraduate educational stage, which is the first postsecondary learning stage (NCES, 2022). In terms of operational definition, an associate degree is a categorical variable measured on a nominal scale of Yes or No, where Yes implies student enrolment in the program. IPEDS defines associated programs in terms of associate degrees awarded over a given period.

     Bachelor's Degree- A bachelor's program is an undergraduate degree where individuals study subjects of their choice at a postsecondary learning institution (NCES, 2022). In terms of operational definition, a Bachelor's degree is a categorical variable measured on a nominal scale of Yes or No, where Yes implies student enrolment in the program.

     Blended/Hybrid Instruction- Theoretically, hybrid or blended instruction connotes a learning approach in which instructors utilize multiple modes to augment learning outcomes with minimal costs (O'Keefe et al., 2020). These may include learning in both online and offline modes, custom content, collaborative learning (Audu et al., 2017; O'Keefe et al., 2020; Sellami et al., 2017), structured/ unstructured learning (Paul & Jefferson, 2019), work and learning, and synchronous /asynchronous formats (Audu et al., 2017). In terms of operational definition, the concept of hybrid instruction is a categorical variable measured on a nominal scale of Yes or No, implying student participation and nonparticipants in learning. The IPEDS measures of blended instruction involved tracking time spent by students on in-person vs. online components. It is also operationalized by tracking completion rates of online modules versus the in-person modules.

Certificate program – A certificate program is a postsecondary learning program used mostly to bridge the gap between diverse stages of education study or to offer additional qualifications and professional training (NCES, 2022). In terms of operational definition, a certificate program is a categorical variable measured on a nominal scale of Yes or No, where Yes implies student enrolment in the program.

Income- Income is the amount of money, property, and other transfers of value attained over time in exchange for products or services (NCES, 2022). In the context of this study, income is a continuous variable measured by the amount of financial aid disbursed to students. The financial aid advanced to students is indirectly associated with the socio-economic status of students. The IPEDS defines financial aid in terms of number of recipients and the average amounts awarded to students.

Instructional Modalities- The theoretical definition of instructional modalities is the teaching approaches that provide critical information to students by setting expectations for their learning experiences (Mishra, 2020). Walden et al. (2022) argued that the accurate use of instructional modalities ensures APU's ability to reliably report on methods of class delivery. Instructional modalities also encompass considerations about prediction modalities. Concerning prediction modalities, it has been ascertained that prediction errors, or how closely the results of the actions match the predictions, are given special weight in reinforcement learning models (Mishra, 2020). Various models employ various kinds of prediction errors for the best learning. Three main types of instructional modalities include in-person, online, and blended/hybrid instructional modalities.

In-Person Learning- Refers to instructional interaction that takes place in real-time involving students and instructors and that allows the concerned parties to contribute towards learning despite the geographical locale differences (H. Lei et al., 2018). In terms of operational definition, in-person learning is a categorical variable measured on a nominal scale of Yes or No, implying student participation and non-participants in in-person learning.

Online Instruction- Refers to a model of learning in which instructors and their respective students establish contact through technology with the objectives of reviewing lectures, submitting assignments, and communicating regarding course objectives, relevant topics, and course deliverables or expectations (Altindag et al., 2021). Online instruction is a categorical variable measured on a nominal scale of Yes or No, implying student participation and non-participants in online learning.

Significance of the Study

The outcomes of this study have potential significance in practice, research, and American society in general. In practice, the significance of this study stemmed from the possibility of its findings helping reduce inequalities in academic achievement. The substantial practical implications relate to informing policymakers and guiding decisions on allocation and designing an inclusive learning environment. Higher learning institutions can draw from these insights to refine educational delivery methods and subsequently adjust their course designs, technological infrastructure, and support services to meet the needs of students from diverse socio-economic backgrounds. Some of the practical policy interventions include those seeking to address the digital divide as a way of ensuring that all students from diverse socio-economic backgrounds have equal access to the digital resources needed to thrive in these learning environments. This is consistent with Hass et al.'s (2023) acknowledgment that the digital

divide, which is linked to the economic status of students, contributes to educational inequalities against students from poor economic backgrounds.

The study insights may be used by educators to tailor their teaching strategies to accommodate different learning styles to potentially enhance the overall academic outcomes of students. The study findings provided insights into how various instructional modalities are affecting the academic success of different demographic sub-groups. These insights might be used by educators to tailor their instructional modalities to specific demographic sub-groups for enhanced academic outcomes. Baldock et al. (2021) argued that appropriate usage of instructional modalities offers students the ability to provide timely and accurate reports of instruction delivery approaches, which in turn helps teachers to improve pedagogy approaches utilized to enhance the academic achievement of specific demographic groups of students.

The academic contribution of these findings includes the evolution of pedagogical practices. In addition, study findings may also serve as catalysts for future research to explore the aspects of online and hybrid learning and fuel studies into specific instructional designs for promoting educational equity among diverse student groups. The potential theoretical implications include generating growing interest from the researcher regarding the intersection of technology-mediated education and equity. The findings of this study can provide a detailed framework for evaluating different aspects of equitable educational outcomes within diverse learning environments. The findings provide a contemporary context to enrich the scholarly debate on this crucial intersection of education, technology, and equity.

The social implications of these outcomes are the potential to mitigate disparities in accessing quality education. The insights gained from these findings may be used to bridge the gap among students from different socio-economic, racial, or geographical backgrounds, thereby

promoting equitable access to education. Moreover, customizing learning modalities to support

equity can foster inclusivity and empower students, thereby contributing to a fairer educational

environment where students from diverse socio-economic, racial, cultural, and geographical

backgrounds can thrive in society.

In general, the American society may, over time, realize economic gains from a more

skilled and diverse workforce. Equitable educational opportunities could be available to students

from diverse economic and racial backgrounds who could significantly contribute to a more

skilled and diverse workforce. The American society could become better equipped with the

required workforce to meet demand in the labor market and address societal challenges and

technological advancements. The findings of this study have the prospect of transcending the

influence on educational practices and policies, as they play a critical role in fostering a more

inclusive, empowered, and prepared society.

Summary

The purpose of this secondary analysis study was to identify factors associated with

inequities in success measure scores by equity group within the IPEDS 2017 – 2021 data while

also aiming to investigate the role of course modality in relation to measuring scores. The study

is based on the need to improve equity in academic achievement among students in light of the

different instruction modalities and the demographic factors of age, gender, race, and

socioeconomic status. The study was conducted utilizing IPEDS data, which were then subjected

to a multi-level secondary analysis. The researcher's theoretical focus was on Rawl's theory of

justice as well as on the elements of academic achievement and instructional modalities.

There remains a need to improve equity by researching the factors that relate to inequities

in student outcomes (Castelli & Sarvary, 2021; de Brey et al., 2019; Mishra, 2020). Additionally,

given evidence on inequity in online education (Joosten & Cusatis, 2020), additional research is needed on the role of online education, compared to blended learning or in-person modalities, as related to issues of inequity in student outcome measures. There was a dual problem of interest in this study. Although blended learning and online options in higher education allow for increased access, there is evidence that students within vulnerable groups face barriers to achieving academic success in blended and online learning environments (Castelli & Sarvary, 2021; Joosten & Cusatis, 2020; Mishra, 2020). Due to this challenge, there is a need to examine the trends in academic success measures by vulnerable student groups, referred to in this study as equity groups, to identify areas to improve equity in student achievement.

Chapter Two: Literature Review

Overview

Preliminary research indicates that the challenge of equity in education has been a significant concern in the United States education system for years (Amaral, 2022). History of the inequities in the education system traces back to the origins of the education system in the country and the struggle for inclusion and civil rights by African American activists (Farrington et al., 2021). According to Raja and Nagasubramani (2018), technological advancement and its adoption in the education system cannot be ignored. However, Buzzetto-Hollywood et al. (2018) stipulated that information literacy and access to technological devices further aggravate education equity in adopting online and hybrid learning modalities. Significantly, a myriad of studies and literature, including Ancheta (2022), Greenhow et al. (2022), Mukhtar et al. (2020), and Valverde-Berrocoso et al. (2020) agreed that the onset of uncertainties disrupting the process of learning, such as the COVID-19 affirms the need to understand the equity factors and design policies enhancing education access for the vulnerable groups.

The purpose of this quantitative, secondary analysis study was to identify factors associated with inequities in success measure scores by equity group within the United States postsecondary education system. This study aimed to contribute to the discussion on education inequity by looking into the long-term effects of the aggressive push for the uptake of online learning and blended teaching modalities. The research considers the effects of online and blended learning on the indicators of education success with regard to equity variables. The success indicators considered include how online courses promote access and enrollment, program completion and retention rates, basic skills completion, degree or certificate, and transfer to four-year colleges.

In this literature review, the researcher provides an overview of the background of the research problem and a restatement of the purpose of the research. This is followed by a discussion of the theoretical framework, starting with Paulo Freire's (2000) writing of the pedagogy of the oppressed and an in-depth discussion of J. Rawls's (1971) theory of justice. Alexandar Astin's 1985 theory of student involvement in college, considering three crucial elements: inputs, environments, and outcomes (IEO model), provides further context for understanding the trends experienced by student equity groups. The third section focuses on the discussion of equity in higher education with in-depth explanations of success measure scores within equity groups considering the role of demographic variables related to academic success measures, specifically gender, age, race, and socioeconomic status. Lastly, the role of various modalities, including face-to-face, online, and hybrid/blended learning as related to academic success measures, was explained.

Theoretical and Conceptual Framework Review

The theoretical review focused on three theories related to educational equity. These are pedagogy of the oppressed, the theory of justice, and the student involvement theory. A detailed review of these theories is explained in the section below.

Pedagogy of the Oppressed

Paulo Freire wrote the pedagogy of the oppressed in the 1970s. Freire (2000) developed a theory of education combining philosophical and political views relating to the needs of a capitalist society's marginalized and disenfranchised members. According to Peters and Besley (2015), Freire was born in Recife in 1921 and passed away in 1997 in Sao Paulo, Brazil. He was a Portuguese teacher in Brazilian secondary schools for seven years between 1941 and 1947. He also worked as a teacher's trainer and was actively involved in adult education. Thus, his

arguments and assumptions made in the pedagogy of the oppressed were informed by individual experiences and observations as a Brazilian teacher and a victim of political exile. Ramalho (2022) stipulated that the pedagogy of the oppressed argued for an education system emphasizing learning as an act of freedom and culture.

The first argument of the pedagogy of the oppressed identifies humankind as the primary problem advancing the challenge of oppression (Freire, 2000). He posited that the process of identity affirmation is constantly interrupted by the established systems of oppression that use violence to oppress and exploit the people. However, the oppressed can regain their humanity through liberation struggles, but the strategy can only be successful if initiated and managed by the oppressed population (Book Rags, 2014). Therefore, the first assumption of the theory concerning education was how to establish an education system for the vulnerable groups or the oppressed in society and by the oppressed to ensure the achievement of freedom (Ramalho, 2022). Consequently, Freire (2000) analyzed the strategies implemented by the oppressors, such as alienation of the affection of the consciousness of the vulnerable groups, creating the illusion that the oppression is good. Thus, Bhattacharya (2020) directed that liberation and empowerment through education allow vulnerable groups to reflect on the nature of oppression and empowerment to take action for change.

Freire introduced education theories emphasizing the banking model of education (Freire, 2000). In his view, the traditional teacher-student relationship accords all knowledge and power to the teacher. As stipulated by the banking model, the teacher "deposits" information in the students' minds, and the students are tasked with recalling and memorizing the information (Peters & Besley, 2015). Ramalho (2022) stipulated that Freire commented on the banking model, arguing that it advances the acceptance of oppression instead of allowing students the

freedom of critical thinking. Freire (2000) proposed the problem-posing education model, making the students and the teachers equal, hence advancing the dialogue and student empowerment to analyze problems and question conditions.

Dialogue is essential for empowering and advancing equity in education (García-Carrión et al., 2020). Freire (2000) posited that dialogue is a humanist education strategy relying on hope, humility, love, faith, and mutual trust between the student and the teacher. Adopting the problem-posing education model encourages collaboration between students and teachers in knowledge acquisition (Jupp Kina & Gonçalves, 2018). Research stipulated that the problem-solving model advanced by Freire (2000) is a critical tool for social transformation through education (Casagrande et al., 1998; Khandekar, 2021; Knipe, 2020). The transformation is achieved through developing critical awareness among the vulnerable groups facilitated by the educator by focusing on societal problems posed as problems to be solved by the students (Khandekar, 2021). Ramalho (2022) stipulated that the dialogic process of education creates a revolutionary habit among the oppressed, combining critical reflection with actions and cooperation, influencing each other in the struggle for emancipation.

Freire's (2000) theoretical propositions of problem-solving have been applied in various fields of education (Casagrande et al., 1998; Khandekar, 2021; Knipe, 2020). Casagrande et al. (1998) proposed using a problem-solving education model to transform health education and professional practices. The researchers identified that Freire's proposed model can be adequately applied in various nursing and health professions. Similarly, Knipe (2020) posited that the challenge posed by the multifaceted nature of social work education poses immense problems to students. In this regard, the researchers indicated that implementing a problem-solving model develops competent social work practitioners able to examine the historical, cultural, and

sociopolitical roots of social problems and enhances the development of consciousness. The delineations made by the previous researchers are supported by García-Carrión et al. (2020), who posited that dialogic teaching and learning is an essential tool leading to effective teaching practices, mindset transformations, and sociocultural transformations among others.

The research problem analyzed by this research proposal is the inequities in education affecting the success rates among students of higher education, especially those in community colleges. Freire (2000) stipulates that the traditional educational model is an exercise of domination over the students. The theoretical arguments posited by Paulo Freire argue for the role of teaching modalities in relation to measures of academic achievement among oppressed or vulnerable groups. Bhattacharya (2020) argues that the fears stipulated by Freire are evident in the 21st-century education sector. The rising wealth and income inequalities are born out of politics formulated by the oppressors' or the elite in the society, corporations, and politicians who are the more powerful to preserve their interests at the expense of the minority and racially disadvantaged. According to Knijnik (2021), the ideas put forward by Freire are still relevant and very powerful, prompting the privileged to rally for its eradication with the objective of further advancing inequalities by the conservatives. Similarly, (Masood & Haque, 2021) posited that Freire's pedagogy is critical in the modernized digital and online classrooms prompted by the COVID-19 outbreak and the increased technology adoption in the classrooms.

The pedagogy of the oppressed was justified in anchoring this study. This theory was advanced in response to societal oppression, advocating for an educational system that liberates and empowers marginalized groups. The concept of liberation lies at the core of Freire's argument, proposing a model that fosters equality for all students. Freire's work is relevant because it emphasizes dialogue, critical thinking, and empowerment through online and blended

teaching, thus providing a lens to assess the effectiveness of teaching modalities across demographic sub-groups. Hence, Freire's concept of "Pedagogy of the Oppressed" offers a theoretical framework for analyzing how online and blended modalities address education inequities among diverse student demographics.

Theory of Justice

John Rawl's theory of justice was first advanced in the conversations of social justice in the early 1970's. Rawl attempted to resolve the problems of distributive justice within society. Rawls is considered an essential contributor to the ethical and political philosophies of the 20th century. President Bill Clinton awarded him the National Humanities Medal in 1999 for his crucial contributions to political policies and academics. According to Mabe (1973), Rawls's original position opposed the utilitarian view of what constitutes a just society, social actions, policies, and just institutions. The utilitarian argument holds that justice is achieved when society pursues the greatest good for the most significant number of people (Ward, 2020). According to J. Rawls (1971), Rawls developed the theory of justice through the social contract approach.

The social contract theory proposes that distributive justice can be achieved through a contractual agreement among the members of the society to ensure that no party becomes more advantaged compared to the other (Mabe, 1973); J. Rawls, 1971; Said & Nurhayati, 2021). Consequently, Rawls stipulated that the social contract agreement is behind a veil of ignorance that refutes the importance of personal characteristics, including gender, level of income, ethnicity, and age, which creates bias (Mabe, 1973). Thus, in the absence of consideration of individual characteristics, the members of the society could align the principles of justice to individual advantages. In addition, Rawls assumed a society governed by the principles of free and fair interactions among the members of the society (J. Rawls, 1971). In a free and fair

society, there is a lack of differences between the populations, allowing the talented and the privileged to oppress the vulnerable populations. J. Rawls (1971) presented the principles of equal liberty and equality as the governing frameworks in a society of rational individuals.

The principle of equal liberty stipulates that all people have equal rights and fundamental liberties (Mabe, 1973; Maluleka, 2020; J. Rawls, 1971). The fundamental rights and liberties include democratic rights, association, expression, and conscience, among others. Regarding distributive justice, J. Rawls (1971) included the property right, which should not be amended or infringed by the government. The second principle of equality directs that economic concepts should be developed in a way that ensures that the least advantaged within the society receive more significant benefits and that every individual has the right to hold official or political positions regardless of race, gender, social, or ethnicity (Said & Nurhayati, 2021).

Rawls's theory of justice has been previously applied by researchers exploring the concept of equity in education (Costa, 2021; Ward, 2020; White, 2021). For instance, Ward (2020) stipulated that the vulnerable populations in the United States, specifically the refugees seeking asylum, should be recognized as members of the United States social contract. Therefore, these youth refugees in the U.S. are bound to receive government support in American schools to represent equitable education distribution following Rawls's equality and equal liberty principles. Similarly, Costa (2021) posited that Rawls's theory of justice is traceable in 21st-century philosophies of education. In addition, Costa (2021) depicted that applying Rawls's concepts goes beyond the works related to fairness and justice in education. In this regard, White (2021) indicated that Rawls's argument on the good is critical for the student to understand the importance of education to improve well-being and enhance personal flourishing. In addition, Kliewer and Zacharakis (2015) presupposed that higher education is

crucial to instill strong leadership backgrounds in students on the concepts of justice and fairness through the imposition of skills and habits ensuring fairness, equality, and equality rights.

The theory of justice relates strongly to equity in education. According to Anthony and Padmanabhan (2010), the continued digital divide created by digital transformation and the adoption of technology in education, such as online education, threatens the affordability, accessibility, and availability of education between the wealthy and the poor. In this regard, a strong connection exists between Rawls's arguments and the problem of inequity in education advanced by the promotion of online learning. The study conducted in India indicated that the adoption of Information and Communications Technologies (ICT) in education creates a divide in education as the poor are hindered from accessing the same opportunities (Anthony & Padmanabhan, 2010). Therefore, governments and other members of the social contract need to ensure that in the process of distribution, the greater good for the less privileged is achieved (J. Rawls, 1971; Said & Nurhayati, 2021). Maluleka (2020) stipulated that parent and student involvement is essential to promoting technology adoption in education. Thus, the course modality chosen by the educators should sufficiently include parents as education custodians of the knowledge systems, which relates to the current study by examining parents' role in online learning.

The choice of justice theory as a theoretical framework for this study was justifiable for multiple reasons. Rawls emphasized a societal contract that transcends personal attributes, advocating justice and equal opportunities regardless of gender, income, or ethnicity. The theory of justice serves as a valuable tool for assessing the effectiveness of online and hybrid learning in reducing educational inequity and success. In the context of this study, the theory of justice supports equitable education distribution. Furthermore, justice theory intersects with challenges

like the digital divide, where reduced access to technology and the internet exacerbates educational inequity for vulnerable groups, necessitating governmental intervention to ensure equitable access. Secondly, the present study sought to determine whether teaching modalities of online and hybrid instruction affect the academic success of students of various demographic groups. The adoption of justice theory can be used to explain the role of teaching modalities in shaping the academic success of students from various demographic groups. This is essential in identifying and addressing the demographic groups that are vulnerable to education inequity.

Theory of Student Involvement

Alexander Astin developed Astin's theory of involvement to explain student involvement in college (Astin, 1984). The theory is referred to as the IEO model because it is based on three crucial elements, including inputs, environments, and outcomes (Rahman et al., 2020). Using these three elements, the theory posits to explain the view of desirable outcomes from higher education institutions regarding how the students develop and change through involvement in the institutions' activities and interactions within the environment (Chaves, 2006). According to Astin (1984), the first element, Inputs, concerns the students' characteristics, such as their backgrounds, demographics, and other individual experiences. The second element, environment, refers to the interaction within the institutional grounds and relates to experiences during the student's life in college. The third component is Outcomes, which covers the student's change in characteristics, values, beliefs, attitudes, and knowledge when they graduate from college.

Astin's IEO theory is based on five essential assumptions about student involvement. First, the theory stipulated that involvement mandates considerable physical and psychological investment (Astin, 1984). Second, involvement is a continuous process, and the amount of

energy invested depends solely on the students and hence differs from student to student. Third, involvement aspects are quantitative and qualitative (Vetter et al., 2019). Fourth, the outcome experienced or development is directly related to the quality and quantity of student involvement (Bergen-Cico & Viscomi, 2012). Lastly, Astin (1984) theorized that a direct relationship exists between student involvement and academic performance.

The theory has numerous applications in the research on higher education and has been applied in studies for student engagement, co-curricular activities, and social interaction in higher education institutions. Cheng (2022) used the IEO model to illustrate student development through involvement and residential experiences to better understand the different dynamics of residential outcomes. A study conducted among Filipino students by Ramos (2022) implemented Astin's theory to examine the academic involvement among nontraditional college students in the Philippines. In addition, (Zong & Davis, 2022) stipulated that Astin's model is essential in evaluating and remodeling performance and graduation rates among higher education institutions.

Astin's Theory of Involvement is relevant in anchoring the present research. Austin's theory presents a detailed framework to understand student engagement and how it impacts higher education outcomes. The foundational elements of this theory, Inputs, Environments, and Outcomes (IEO), are essential in evaluating the effectiveness of teaching modalities. Inputs in the constitute SES, access to resources, and lack of prior educational experiences of parents all have a significant influence on academic engagement and success within different teaching modalities. The component of environment constitutes the interactions and experiences within educational settings. Accessibility to online and blended education varies for different demographic groups. The outcomes component refers to academic performance and differs

across groups due to varying levels of access, support systems, and adaptability to different teaching modalities. The adoption of involvement theory is essential in understanding how various demographic variables contribute to education inequity by influencing academic success through online and blended instruction modalities.

Review of Pertinent Literature

Equity in Higher Education

The limited achievements among students from under-represented and vulnerable groups indicate that equity in higher education remains a significant concern for policymakers and universities (Larsen & Emmett, 2020). Myriad research has identified a strong relationship between equity in education and academic success measures, including access, enrollment rates, retention rates, graduation rates, fundamental skills, and transfer rates (MacGregor, 2020). Amaral (2022) stipulated that the fairness component of equity ensures that students' social and individual circumstances do not hinder their educational potential. Consequently, as defined by J. Rawls (1971), education is a fundamental right for all, and inclusion should ensure that all students have access to and attain the basic education standards. Researchers into equity in higher education theorized that the massification of higher education could reduce education inequalities (Hornsby & Osman, 2014; Mok & Jiang, 2018; Noui, 2020; Selyutin et al., 2017). However, the inequalities continue to persist (Amaral, 2022). In this regard, individuals from vulnerable groups have reduced access to education, which becomes a positioned good that can be used to oppress the underprivileged, as hypothesized by Freire (1978), further increasing the complexities of attaining fairness in education equity.

Equity in higher education is perceived under the notion that academic success measures and performances should be the same across different student groups irrespective of gender,

ethnicity, race, social class, and socioeconomic status (Amaral, 2022). In this regard, education

outcomes should be measured in relative equity, relating to individual contributions or efforts by

recognizing and making available the students' subjective needs in relation to their gender, social

class, race, ethnicity, and socioeconomic status, among others. According to Burke et al. (2015),

although many countries and governments have recognized the importance of equity in higher

education, most are yet to understand, prioritize, and implement relevant policies addressing

equity in higher education. Therefore, there are significant differences between countries

concerning education achievement (Levin, 2003). However, the gaps between countries are less

concerning than the education equity gaps within countries.

Ellsworth et al. (2022) indicated that historically underprivileged and marginalized

communities in the United States regarding ethnicity and race, such as African Americans,

Native Americans, Pacific Islanders, Latinos, and Hispanics, are still highly underrepresented

among higher education students and faculty leadership. In addition, the analysis indicated that

students from these vulnerable groups have worse education outcomes when measured in terms

of graduation rates. In contrast, other countries, such as South Korea, have significantly reduced

education inequalities over the last decade. According to Byun (2021), the egalitarian approach

adopted by the South Korean government in their education expansion policies ensured high

standardization of education institutions and learning environments, resulting in improved

education outcomes due to the reduction of subjective conditions on student academic

achievements. In this regard, the education equity discussions in South Korea transverses the role

of demographic variables and modality to the effects of standardization on enhancing mediocrity,

especially among high-achieving students. (Lim & Park, 2022). In contrast, Lusigi (2019)

posited that countries across Africa are grappling with intensive education equity gaps in higher

education due to structural and technological barriers and a diverse digital divide across and within countries.

Student Academic Achievement and Success

The concepts of academic achievement and success are interchangeably used in an educational environment to refer to student outcomes. However, these concepts encompass distinct dimensions and interpretations across scholarly discourse. The concept of "Academic achievement" is used in reference to measurable educational outcomes based on criteria such as grades, test scores, course completion, and mastery level of subject matter. However, other crucial aspects of outcomes, such as problem-solving skills, critical thinking, and creativity, are not captured under the academic achievement concept. The concept of academic success extends beyond grades and test scores and includes a wider range of outcomes such as personal growth, contribution to research, intellectual development, and societal impact. Hence, academic success is indicated by scholarly contribution and recognition in the field based on research publications, presentations, awards, and grants.

Student Academic Success Measures

Academic success measures refer to metrics used to determine whether or not persons or organizations (including educational institutions) have succeeded in reaching their objectives (Mishra, 2020). Successful organizations utilize a range of standards to assess their individual and collective accomplishments since there is no one real definition of success (J. R. Rawls et al., 2019). The success of a school system, or academic success measure, is evaluated using both short-term indicators, such as test scores and attendance, as well as long-term indicators, such as graduation rates, college preparedness, and rates of school suspension. Course, certificate, and degree completion are key measures of academic success since attending college is a major

investment in time and capital resources for both students and families. Therefore, completion rates can serve as an essential purpose for the higher education system (NCES, 2023).

Role of Demographic Variables as Related to Academic Success Measures

Researchers have attempted to investigate the factors influencing students' academic performance in higher education institutions. Many of these researches have focused on the role of demographic variables such as gender, age, race and ethnicity, and socioeconomic demographic variables (Alhajraf & Alasfour, 2014; Casanova et al., 2005; El Refae et al., 2021; Nawa et al., 2020). The outbreak of Covid-19 and the emerging challenges and changes in the education sector around the world prompted El Refae et al. (2021) to investigate the impact of the demographic variable on academic performance among students in the United Arab Emirates. The study compared face-to-face learning modalities with online learning and found a significant relationship between demographic variables and academic success measures in both modalities of learning. Similarly, Nawa et al. (2020) investigated the relationship between demographic variables and academic success measures among medical students in Japan. They reported that students from low-income geographical regions were more likely to repeat or withdraw from medical schools than those from high-income neighborhoods around the National Capital Region. Consequently, the study stipulated that gender significantly determines academic performance.

The findings reported by the above researchers support the arguments made by Alhajraf and Alasfour (2014), who posited that the student's age, gender, ethnicity/race, and socioeconomic status, among other demographic variables, are significant predictors of academic success measures in institutions of high education. The choice of gender, age, race/ethnicity, and socioeconomic status as demographic variables for this analysis was informed by their extensive

documentation in the scholarly works exploring the influence on academic success and achievement in higher education (Alhajraf & Alasfour, 2014; Casanova et al., 2005; El Refae et al., 2021; Nawa et al., 2020). These factors are relevant due to their close links to students' performance across diverse educational settings. Additionally, these demographic variables were relevant in this study because they are captured within the IPEDs data.

Gender Differences. Differences in academic achievement have been linked to gender differences. Delaney and Devereux (2021) affirmed the existence of gender differences in academic achievement, stipulating higher education achievement among females compared to males, a phenomenon they identified as "the boy problem." The situation is especially evident among students from low-income households (Akabayashi et al., 2020; Delaney & Devereux, 2021). Extensive research from the United States indicates the existence of academic achievement gaps in favor of females from low socioeconomic status families and families with absent fathers (Autor et al., 2019; Delaney & Devereux, 2021; Figlio et al., 2020; Z. Lei & Lundberg, 2020). In this regard, Delaney and Devereux (2021) stipulated that family and parental socioeconomic status determine the rates of college attendance for boys rather than girls, creating a high gender gap in favor of girls from low-income populations.

The contrasting evidence of gender differences in academic achievement has also been documented. Z. Lei and Lundberg (2020) noted that although family vulnerabilities affect academic success measures for boys in the initial stages of education, after gaining college attendance, socioeconomic status does not pose significant effects on the gender gap with outcomes such as graduation rates and college completion. Similarly, a study conducted by Brenøe and Zölitz (2019) in Denmark indicated similar outcomes where family disadvantages held non-significant adverse effects on graduation rates between male and female students.

Aucejo and James (2019) explained that the condition explains the differences in that family socioeconomic status substantially influences high school completion rates, with stronger influences evident for males than females. Therefore, while it is evident that family disadvantage significantly increases the gender gap in educational achievement between males and females when both genders have the chance to attend university, the family background has lower impacts on completion rates and academic achievement in the long term.

Further, gender inequity in academic achievements has been attributed to various factors, including the field of study. Delaney and Devereux (2021) stipulated that the gender gap relates significantly to the differences in the choice of fields of study in universities and colleges. Evidence on academic performance from high schools illustrates that boys perform better in technical, economic, and STEM subjects (science, technology, engineering, and mathematics) while girls choose female-oriented fields such as teaching, nursing, and less technical areas of study (OECD, 2020). Consequently, Astorne-Figari and Speer (2019) noted that female students enrolled in technical and STEM subjects are more likely to transfer from these fields to less technical fields within the first year of college admission. Delaney and Devereux (2021) illustrated that the choices in academic fields significantly affect academic achievement, with higher graduation rates reported from female students compared to male students.

Age Differences. The age impact on academic achievement among younger students diminishes in higher education. Tafamel and Adekunle (2016) stated that age is a significant predictor of academic performance. Predictors of academic achievement have identified that age significantly affects academic performance among younger students (Cáceres-Delpiano & Giolito, 2019; Nalova & Etomes, 2019; Nam, 2014). However, more research has refuted the claim that age has less significant effects on academic achievement, especially in higher

education (Imlach et al., 2017). Nam (2014) researched South Korean students and found that age determines performance during the earlier stages of education in middle school and lower secondary, but the effect does not persist after students enroll in upper secondary education.

Nalova and Etomes (2019) reported a significant relationship between age and academic achievement in English and mathematics among primary school students in both private and public schools. Similarly, Cáceres-Delpiano and Giolito (2019) reported on the impact of age on school outcomes among Chilean students and noted that the effects are significant in the first eleven years, after which academic performance is not affected by the student's age. The above studies indicate that age is a significant determinant until a certain age, after which other predictors of success, such as academic motivation, become the determinants of academic success measures. The findings coincide with the arguments by Imlach et al. (2017), affirming that age is not a predictor of academic achievement among older students. By investigating the factors related to older university students' academic performance, Imlach et al. (2017) found that life experiences, cognitive development, and language processing positively influence academic success.

Generational Status

The academic success of students differs between first-generation and continuous-generation immigrants. Positive aspects contributing to the academic success of first-generation students relate to their resilience and determination (Burger & Naude, 2019). Considering a strong drive and motivation to succeed academically among this population cohort can compel them to realize higher academic success than continuous generation students. The desire to better their lives and their families serves as a motivator to pursue and succeed in their academic journey. In addition, a strong work ethic among most first-generation students, which is

attributed to family-instilled values, contributes to education success through their dedication to academic pursuits (Almeida et al., 2021). The influence of family values, such as seizing opportunities, persistence, valuing education, and balancing responsibilities, provide a strong basis for these students to excel academically.

Parenting acts as a barrier to the academic success of first-generation students due to a lack of supportive social networks from parents. The fact that neither of the parents completed their higher education within the United States is a critical factor that significantly hinders the educational success of first-generation students (Ives & Castillo-Montoya, 2020). Lack of a familial history in higher education is linked to limited guidance and support needed not only to motivate them to attain educational goals but also to help navigate the challenges of the educational system (Mishra, 2020). However, the parental variable is not measured consistently in education literature and is not captured in education databases such as the IPEDs data, making it not a feasible variable in this study.

The economic constraints of first-generation parents act as a key barrier to accessing educational resources. In their study, Mason et al. (2022) found a strong correlation between parental socio-economic status and college education. These findings highlighted that first-generation students seeking college differ from their continuing-generation in ways that reduce their chances of attending college. These authors observed that despite competitive first-generation college graduates taking definite steps to pursue a medical career, they experienced a decreased chance of being accepted by accredited medical schools compared to continuing-generation graduates. The difference in college acceptance and attendance between first and continuing-generation students was attributed to inadequate financial resources and lack of social support for college applications. Similar findings by Wilcox et al. (2022) reported that first-

generation students experienced higher levels of personal and professional financial pressures in pursuing higher education and showed a higher likelihood of postponing significant life milestones compared to their continuing-generation peers. These scholarly works underlined the financial distress among first-generation students in the United States.

Some scholarly findings revealed that generational differences in academic achievement are influenced by age and socioeconomic gaps (Pivovarova & Powers, 2019). These findings support existing evidence about the second-generation advantage in academic achievement over first-generation students attributed to differences in socio-economic status. The exclusion of generation status as a demographic variable in studying the academic success of students is attributed to its close links with socio-economic economic status. The generational status variable is limited in literature because generational differences in academic achievement are closely linked to socioeconomic gaps (Pivovarova & Powers, 2019). Additionally, this demographic variable is not feasible in the context of this research because they are not consistently measured in scholarly works in educational settings. Moreover, the generational status variable is unfit for secondary studies because it is rarely captured within educational databases such as IPEDs data, which constitute the main source of data for secondary analysis research in education settings.

Race and Ethnicity. Historical inequities against minority racial groups, including denial of access to education, have adversely affected academic outcomes. Research on marginalization and racial disadvantage reported a significant relationship between race and the differences in academic achievements between ethnic minorities and ethnic majorities, especially in the United States (Assari et al., 2021; Aucejo & James, 2019; Jones et al., 2020; Penney, 2017). According to Jones et al. (2020), the racial inequities reported in academic achievement among students

from different ethnic backgrounds in the United States are attributed to the long history of denial of academic access to ethnic minorities, especially African Americans. Research in the history of education struggles among Black Americans traces the inequalities back to slavery, where it was considered unlawful to educate the enslaved people. Evans III (2015) explained that people of color were viewed as private property, fewer citizens, and inferior, creating challenges concerning their assimilations and integrations into classrooms. After struggling for and earning the right to education, the educational progress of people of color was further hindered by the implementation of the rules of segregation (Farrington et al., 2021). The presence of Black and White schools widened the educational achievement gap by developing inferior and superior education platforms in favor of the White students who received better teaching and education resources (Evans III, 2015). Eventually, segregation was abolished, but the inequities had already been entrenched in the education system, further aggravated by the increase in the presence of multicultural and ethnic groups in the United States. According to Jones et al. (2020), students from African American backgrounds attend schools with inadequate resources, face stricter disciplinary actions including expulsions, and are less likely to be encouraged to advance their education progress in higher education. Thus, racial inequities continuously manifest in the levels of academic success indication that race is a significant predictor of education achievement among students in the United States.

Historically, African Americans have experienced lower academic attainment among minority ethnic groups compared to white students (Jones et al., 2020). Research into the long-term effects of education achievement indicates that the lower success reported among black students translates to lower demographic status, including levels of income, health outcomes, adverse effects on life outcomes, and reduced possibilities of increase in socioeconomic status,

which translates to generational vulnerabilities among the group and education equities (Evans III, 2015; Farrington et al., 2021; Jones et al., 2020). Research conducted by Paschall et al. (2018) indicated that the gap between black and white students' academic achievements continues to widen, becoming a significant challenge for researchers and policymakers alike. For decades, stakeholders have put considerable effort into closing the education achievement gap and have created policies such as No Child Left behind designed to improve education aces and success for black students (Jones et al., 2020). According to Assari et al. (2021), racial differences are closely related to black families' socioeconomic status.

Academic achievement, especially among kindergarten, middle school, and secondary school students, is significantly influenced by socioeconomic status (Assari et al., 2021; Leath et al., 2019; Paschall et al., 2018). Parental education status defines the family's socioeconomic status (Assari et al., 2021). In this regard, highly educated parents are likely to have higher socioeconomic status, resulting in enhanced investment and support for the student's education. In contrast, low educated parents affect the students' learning environments, influencing education quality and significantly the levels of academic achievement. Another socioeconomic factor outlined by Leath et al. (2019) is the presence of predominantly black urban schools and predominantly white schools. Students from families with low socioeconomic status attend urban schools with insufficient resources and reduced quality of education.

Further, challenges with racial identity development brought about by student interactions with their social contexts have significant implications on academic achievement (Leath et al., 2019). In this regard, the school environment is crucial to developing these racial-related experiences linked to various academic success measures, especially engagement and motivation. However, research indicates that students do not view the issue of race and racial

discrimination the same way (Lozada et al., 2016). Therefore, the implications of race on academic achievement are determined by individual beliefs about the meaning and importance of racial groups to some extent. Similarly, Isik et al. (2018) posited that the individual implications differ between genders, translating to varying experiences of stereotyping and discrimination between black boy students and black girl students. However, (Leath et al., 2019) stipulated that racial discrimination is a crucial risk factor for adverse academic success measures among black students.

      Socioeconomic Status. The variable of socio-economic status is intertwined with academic success, with socioeconomic backgrounds posing a significant influence on education outcomes. According to Paschall et al. (2018), the widening poverty gap is at the core of academic disparities between poor and wealthy students. Consequently, extensive research supports the argument for a significant relationship between socioeconomic background and education outcomes (Chen et al., 2018; Gobena, 2018; Z. Li & Qiu, 2018; Thomson, 2018). In the current study, the identified vulnerable or at-risk group refers to students from disadvantaged backgrounds identified through socioeconomic lenses. Therefore, the study identifies the vulnerable groups as at risk of poor academic performance due to their less privileged social and life circumstances. As claimed by Finau and Schademan (2021), an array of adverse cause effects for poor academic success measures, including living in dangerous neighborhoods, mobility, homelessness, drug and substance abuse, unemployment, parents with low levels of education, neglect, abuse, and exposure to other inappropriate experiences affecting education attainment are significantly connected to levels of poverty and socioeconomic status.

      Thomson (2018) defined socioeconomic background as the interpretation of the social, economic, and cultural status derived from the examination of the level of education, family

wealth or income, resources available to dedicate to education, and other possessions related to the culture at home. Z. Li and Qiu (2018) explored how a family's socioeconomic background affects education achievement among students in China. The researchers identified that high socioeconomic status encourages competition among parents for better education opportunities, enhancing performance. Similarly, socioeconomic status influences parenting behavior and the students' learning habits, affecting education outcomes. Z. Li and Qiu (2018) also reported that socioeconomic differences highly affect academic performance among students in urban areas compared to students from rural regions. The findings are substantiated by Thomson (2018), positing that students from lower socioeconomic backgrounds have inadequate parental support and lack a home environment that fosters academic excellence. In contrast, a study conducted by Gobena (2018) found no significant relationship between economic status and education outcomes among students from low-income backgrounds in Ethiopia but reported a high correlation between the family or parents' education level and the student's educational achievements.

Finau and Schademan (2021) stipulated a significant correlation between children's backgrounds and cognitive development. The study investigated the effects of socioeconomic status on children's brain development and, using scientific evidence, found that low socioeconomic status hinders cognitive development. Shi and Qu (2021) stated that cognitive development relates to the student's ability to memorize, analyze, process, and present information, critical and logical thinking, and transformation, all of which are essential to academic achievement. Similarly, Nesayan et al. (2019) found that academic performance correlates significantly to the students' processing speed, organizational ability, regulation of emotions, memory, planning, and monitoring abilities identified as cognitive characteristics. In

addition, Peng and Kievit (2020) illustrate a bidirectional relationship between cognitive development and academic success. In this regard, their finding indicated that mathematical and reading cognitive abilities in terms of working memory, function execution, and reasoning are weaker among low socioeconomic students.

Although socioeconomic factors are a potential hindrance factor to educational achievement, research indicates that the variable is not a significant predictor of educational achievement due to the intrinsic motivation and resilience factors that help students overcome these risks (Chen et al., 2018). In this regard, learning motivation moderates the relationship between academic performance and individual variables, especially intrinsic motivation that arises from engaging in activities based on enjoyment and interests (Rogelberg et al., 2021). According to Chen et al. (2018), extensive studies have identified the relationship between intrinsic motivation and reading performance differences between students with a high ability to read and those with a low ability to read. The studies assume that children with low ability to read and with high intrinsic motivation persevered and worked relentlessly to develop their reading skills while those with low motivation quit. Similarly, among students from low socioeconomic backgrounds, poverty is an undesirable condition hindering access to education (Kim et al., 2018). Therefore, learning motivation plays a more significant role among these students than those from high economic backgrounds.

Learning motivation among students in institutions of higher education is their learning and engagement willingness influencing decision-making and learning process. According to H. Li et al. (2020), economically disadvantaged students take their obligations and roles seriously, increasing their engagement in learning activities, developing self-determination, high efficacy, increased self-esteem, and motivation, positively influencing their learning capabilities. In

addition, Silverman et al. (2021) stipulated that the life experiences of students from vulnerable groups equip them with various perspectives and skills, such as empathy, resilience, and better group performance, enhancing their academic performance. Thus, learning motivation supersedes socioeconomic status as a predictor of academic achievement. Although essential, this study's demographic factor was not considered due to inadequate data within the IPED data set.

Role of Modality Variables as Related To Academic Success Outcomes

Instructional modalities have been shifting from in-person to online learning courses. These online learning courses provide students with flexible learning opportunities, the importance of which was enhanced by the onset of the coronavirus pandemic and its disruption in the United States education system (Ancheta, 2022). IPEDS data from the NCES (2022) indicated that by the fall of the year 2020, over 11.8 million undergraduate students were enrolled in at least one online learning program, which was a percentage of 75% of the total undergraduate enrolment. Among them, 7 million students, which is 44% of all undergraduates, were exclusively enrolled in online learning programs. In comparison to data from the year 2019, the NCES (2022) indicated that the enrollment rate was 97% higher in 2020. Considering equity, the NCES (2022) data indicated that 34% were enrolled in private, not-for-profit organizations. Available data on course completion and graduation rates on the IPEDS website concentrated on first-time, full-time degree- or certificate-seeking undergraduates, which was a major limitation in the investigation of academic success measures.

Face-to-Face Learning Modality. Traditional face-to-face teaching and learning entail the instruction learning modality where the teacher and the students meet in a brick-and-mortar classroom for in-person education delivery (Paul & Jefferson, 2019). The face-to-face learning

process involves classroom lessons, lectures, conferences, workshops, or seminars, which involves a live meeting session with the facilitators, students, instructors, and any other participant in the education process. This learning modality is the most traditional learning method, and it still holds its significance in the modern-day education field. However, it poses some challenges in the technologically advanced education system. According to Paul and Jefferson (2019), the primary advantage of face-to-face learning is the real-time interactions between students, instructors, and peers, offering opportunities for synchronous learning. In this regard, students learn from the instructors and each other, helping students have a better recollection and understanding of course materials. In addition, face-to-face interactions lead to more effective non-verbal communication used to supplement the uptake of knowledge, as positive body language has the potential to engage, inspire, and motivate students (Avazmatova, 2020). In addition, it offers the opportunity to discuss and collaborate through guidance from the instructor and instant and timely feedback.

Similarly, being in familiar, controlled learning environments enhances students' concentration, resulting in better academic success (Paul & Jefferson, 2019). The school is generally designed to enhance concentration and ensure productivity compared to other environments. Consequently, students in a school environment better understand the importance of time management since missing classrooms means missing crucial course materials delivered by the instructor, and the student falls behind (Bouilheres et al., 2020). Thus, students are mandated to plan their time well to ensure they attend classes regularly since failure to be noted by the instructor leads to a reduction in grades. Thus, school environments teach accountability, responsibility, and time management skills that prove essential after graduation and assimilation into work. In addition, live interactions offer the opportunity to create connections and build a

diverse network of friends, peers, and adversaries from different backgrounds, races, and geographical locations, broadening the students' view of diversity (Francescucci & Rohani, 2018). The interactions help students enhance social skills and essentially enhance mental health through social interactions while developing a sense of security and belonging (Burke et al., 2015). The interactions involve fun, creativity, and physical activities such as clubs, sports, and study groups, making learning more enjoyable. According to Paul and Jefferson (2019), the social interactions associated with traditional learning approaches lead to better mental health among students, increasing learning effectiveness, creativity, productivity, and engagement. Similarly, physical activity lessons embedded in face-to-face learning improve physical and mental health.

On the other hand, face-to-face learning is inflexible, increasing pressure on students that could adversely affect their mental health (Paul & Jefferson, 2019). Classes' venues and lesson times are fixed and not accessible on demand. Thus, students cannot plan their time as they wish since they are forced to follow a schedule set in stone that does not allow for a workaround to allow flexibility to the students (Bouilheres et al., 2020). In addition, face-to-face learning modalities tend to rely heavily on traditional approaches, which are sometimes irrelevant in the current world (Masood & Haque, 2021). As such, students learn much information that is inapplicable in the workplace, creating the problem of graduates with insufficient employability skills.

Another challenge is that face-to-face learning is a teacher-centered learning modality, leading to passive learning on the part of the student (Paul & Jefferson, 2019). Thus, the teacher is in absolute control of all dynamics in traditional brick-and-mortar schools. The student's job is to take notes and listen, with the occasional asking of questions, which the lecturer is at liberty to

allow or not. Paulo Freire referred to this learning model as the banking model in which the teachers deposit information, and the students are expected to memorize and relay the information through tests (Underhill, 2021). Uddin (2019) affirmed that the traditional method of knowledge transfer inhibits the students' abilities for critical thinking, problem-solving, dialogue, and problem-solving learning opportunities.

Online Learning Modality. Online learning is the teaching and learning modality that involves interaction mediated by internet-based technology using digital and technological platforms and devices (Greenhow et al., 2022). Extensive research into online learning indicates that this modality is penetrating the education sector; it is evolving and multifaceted, creating both numerous opportunities and challenges for different stakeholders and participants in the education sector (Ancheta, 2022; Greenhow et al., 2022; Henriksen et al., 2020; Valverde-Berrocoso et al., 2020). The wake of the COVID-19 pandemic advanced the adoption of online learning and the intersection between technology, education, and the incorporation of digital transformation and new approaches to learning (Valverde-Berrocoso et al., 2020). According to reports on the effects of COVID-19 on education, the pandemic led to the closure of face-to-face classrooms on a global scale, forcing millions of students, teachers, and education institutions to modify their learning modalities (Ancheta, 2022; Espayos et al., 2022; Henriksen et al., 2020; Khalil et al., 2020; Mukhtar et al., 2020; Valverde-Berrocoso et al., 2020). Ancheta (2022) indicated that with the sudden shift from classroom settings, education institutions developed plans to continue the learning process through asynchronous, synchronous, and blended online learning.

Asynchronous learning, also called independent learning, is the teaching modality allowing students to learn at their own pace and in their own time (Ancheta, 2022). The

instructor provides students with the required workbooks, textbooks, learning materials, modules, worksheets, and other digital resources to assist in independent learning. The mode of communication between the instructors and the students is through learning management systems such as Moodle and Blackboard, emails, social media platforms, and university platforms (Daud et al., 2021). In asynchronous learning, students construct individual knowledge through a personalized understanding of course materials and life experiences (Ancheta, 2022). Sari and Puspitasari's (2021) synchronized online learning model argues that the modality offers flexibility and autonomy to students unable to attend fixed schedules or without full-time access to internet connectivity.

Synchronous learning involves real-time online interactions with peers and instructors using online platforms (Ancheta, 2022). The digital tools employed in this learning modality include video conferencing, chatting through platforms such as google classrooms, live-streaming of class lectures, using zoom, Microsoft teams, google meets, and a myriad of other platforms as chosen by the participants (Henriksen et al., 2020). According to Francescucci and Rohani (2018), synchronous learning mandates that learners and the instructors are on the same online platform at the same time for the learning process to take place, creating a similar environment as face-to-face learning through the use of virtual classrooms and giving opportunities for online interactions, personalized learning opportunities, and immediate answers to student queries.

The challenges to online learning, such as the digital divide, inadequate infrastructure, and internet connectivity, among others, call for an inclusive blended approach to online learning, combining offline (asynchronous) and online (synchronous) learning models (Ancheta, 2022). For instance, as part of the offline models, instructors can record the online sessions and

make them available to students unable to attend live sessions to review during their learning schedules. Rehman and Lakhan (2021)stipulated that blended e-learning ensures inclusivity by allowing learning opportunities for students interested in live interactions and those preferring to study at their convenience. Regardless, online learning provides both advantages and disadvantages to the participants.

According to Mukhtar et al. (2020), online learning offers instructors and students easy communication, facilitation, and delivery of learning content. Features of online education such as discussion forums, polls, chat rooms, quizzes, whiteboards, and surveys allow the participants to share information and dialogue on course content to improve quality and ensure convenient and productive learning models to achieve education goals (Henriksen et al., 2020). In addition, online earning offers student-centered learning opportunities, and the instructors are mandated to ensure the timely dissemination of learning materials and modules that meet the students' needs. Similarly, the instructors schedule classrooms with the availability of the students in mind (Greenhow et al., 2022; Mukhtar et al., 2020). For instance, the instructors in a classroom with a high percentage of working students can schedule synchronous learning events when a large percentage of the classroom can attend.

Ferri et al. (2020) and Panigrahi et al. (2018) stipulated that the rapid adoption of online education, especially in higher education institutions, is due to the reduction of costs for both students and institutions. Bryan and Volchenkova (2016) indicated that online learning eliminates the costs of transport, student meals, and housing, which add to the additional costs of physical learning. In addition, Ebner and Gegenfurtner (2019) and Valverde-Berrocoso et al. (2020) posited that online learning makes materials and learning resources affordable and easily

available through open access, creating a learning environment that is paperless and more affordable.

Regardless of the myriad of opportunities, such as accessibility, efficiency, flexibility, and affordability, online learning has various teaching and learning modality challenges. According to Espayos et al. (2022), the isolation connected to online learning results in struggles and suffering among students developing mental health challenges, including anxiety, pressure, lack of self-confidence, stress, and depression. Students and lecturers suffer mental and physical health issues associated with online learning (Idris et al., 2021). According to Chang et al. (2021), many students suffered various symptoms of stress, anxiety, and depression during the COVID-19-mandated period of online learning. Consequently, Henriksen et al. (2020) posited that the urgent transitions to online learning affected instructors as they struggled with the design of new online teaching modules. Similarly, Idris et al. (2021) reported increased physical and mental stress related to computer use among lecturers, higher workloads, uncertain disruptions, and increased stress levels due to deadlines.

Hybrid/Blended Learning Modality. Blended or hybrid learning combines online and face-to-face teaching and learning modalities (Kintu et al., 2017). The increased adoption of technology in the education sector has led to the rapid uptake of blended learning, especially in higher education institutions. Several research studies into blended learning indicate that this modality can enhance teaching and effectiveness in higher learning institutions (Dziuban et al., 2018; Kintu et al., 2017). According to Dziuban et al. (2018), blended learning enhances learning effectiveness by improving student satisfaction and academic success and enhancing the sense of community among students compared to traditional face-to-face learning or specializing online learning. Bryan and Volchenkova (2016) stipulated that the broad definition of blended learning

allows for different combinations of face-to-face and computer-related hybrid models. For instance, an institution can decide to use different models of hybrid learning, such as a combination of in-class face-to-face learning supplemented by online learning, rotation between online learning, and classroom-based learning and teaching modalities. In this flexible model, the students study mainly online and meet with the instructors individually for support or guidelines. Another model is the online lab model where the students supplement classroom based learning with online courses taken on campus (Dziuban et al., 2018). A different approach to this model is self-blend, where students supplement traditional face-to-face learning with online courses taken off campus. The sixth type is virtual learning, which is strictly online learning and teaching with occasional traditional classroom visits for tutoring (Kintu et al., 2017). Although blended learning has been pervasive in the education system in recent years, it is beneficial and poses challenges to the education sector.

Avazmatova (2020) affirmed that the 21st-century world is a technologically advanced gadget world. Technology is embedded in every aspect of life, and the education system should not be an exception. The primary benefit of technology integration in learning is access to learning resources and understanding of course materials. Among the models of blended learning suggested by Bryan and Volchenkova (2016) is the use of technological devices during lessons. Allowing students to rely on both technology and the instructors broadens their sources of information on a topic, enhancing their understanding. According to Avazmatova (2020), blended learning ensures that there are brick-and-mortar classes in which students can meet with professors for clarifications on both classroom and online materials. However, the extensive debate on the digital divide challenges the concept of improved access where some students within a classroom or in some regions lack the literacy or the digital means to accrue the benefits

of increased access (Buzzetto-Hollywood et al., 2018). Despite the debate, Raja and Nagasubramani (2018) argued that the importance of technology in enhancing students' and teachers' access to information should not be ignored.

Blended learning enhances cost-effectiveness in institutions of higher learning. As stipulated by Dziuban et al. (2018), blended learning provided learning opportunities to millions of students unable to afford the expensive education costs of face-to-face learning. Thus, students from disadvantaged families and those working to support their families can enroll in online education concurrently with their counterparts attending colleges and learn side by side with the instructor providing materials to online learners and attending classes for the in-college students (Avazmatova, 2020; Bryan & Volchenkova, 2016). Consequently, Dziuban et al. (2018) stated that the use of technology in classrooms creates room for the use of open educational resources, resulting in a significant reduction of costs on classroom materials due to the high cost of hardcover books

As stated in the earlier section on face-to-face learning, a major disadvantage is its inflexibility. Blended learning offers a solution to this by allowing the instructors to rely on the face-to-face dissemination of knowledge but also ensuring the students have enough resources by providing electronic lecture materials for the students to use both during lectures and later when revising (Dziuban et al., 2018). According to Avazmatova (2020), unlike in online learning, where access to the lecturers for face-to-face consultancy is almost impossible, with blended learning, students enjoy the perks of both modalities of teaching and learning.

Significantly, blended learning helps universities compensate for limited classroom space while advancing the education policy massification of quality education. In this regard, hybrid/blended education allows universities to increase their enrollment rates significantly

without crowding the brick-and-mortar classes, which would diminish the quality of education from face-to-face education (Kintu et al., 2017). Research conducted by Bouilheres et al. (2020) stipulated that blended learning enhances education quality by promoting interactions among the students, between the instructors and the students, and with the course materials. Thus, as depicted by Avazmatova (2020), blended learning enhances the perceptions of the student's learning experiences through learning flexibility, enhanced engagement, experiences with online learning, and learning motivation through the promotion of self-confidence and access to wide range of digital learning materials.

Summary and Conclusion

The rapid and pervasive push for the adoption of online or hybrid learning within institutions of higher education creates significant implications for academic success in measuring scores among vulnerable equity groups (Parveen & Awan, 2019). The extent of the effects remains unclear, with inadequate preliminary research into the problem. However, available research on online and blended learning indicates that the penetration of technology into the education system is inevitable (Avazmatova, 2020; Raja & Nagasubramani, 2018). Thus, this research explored strategies to reduce the digital divide by investigating equity factors through the lenses of the theory of justice by John Rawls. The rationale for this choice is that Rawls's theory focuses on distributive justice, which is a significant challenge that affects the success of online learning. According to Molina et al. (2017), distributive justice is the perceived fairness in allocation where people judge what they receive depending on how they judge equity, equality, and need. Education is a highly viewed socially constructed public resource whose access is judged through the lenses of distributive justice. A significant challenge affecting the success of online education is the digital divide. J. Rawls (1971) highlighted that distributive

justice is achieved through a contractual agreement among members of society to ensure that no party becomes more advantaged in comparison to the other.

The enforcement of distributive justice in education not only depends on the teachers, parents, and students but is also a responsibility of the government through national policy. The central research questions seek to assess the success of online education in improving education access for traditionally vulnerable groups and minorities in the United States. The Pedagogy of the oppressed by Paulo Freire cannot adequately help answer the question since the theoretical framework focuses on power distribution between the teachers and the students. Consequently, Astin's IEO Model concentrates on student development mediated by their college experiences influenced by individual characteristics, college environment, and change in individual behavior. However, Rawls's theory stipulates that economic concepts in society should be developed to ensure significant benefits to the less advantaged in society (Said & Nurhayati, 2021). The theory can be used to advocate for government involvement in ensuring the equitable distribution of education through the context of equal liberties. Therefore, Rawls's theory of justice is the most suitable for addressing the digital divide through the concept of social contract, which ensures the greater good for the less privileged.

Research into equity in education indicated that the issue remains a significant challenge in technological advancement in the education sector (Amaral, 2022). In addition, trends in academic success measures from IPEDS indicate that online education leads to generally better measurement scores of education achievement. Consequently, the statistically significant variables associated with measure scores include enrollment rates, graduation rates, and rates of transfer to four-year colleges. Similarly, an exploration of the different teaching modalities

indicated that the vulnerable groups are highly disadvantaged in face-to-face, online, or blended learning modalities.

The next chapter will discuss the research methodologies, data collection, and analysis that will be adopted to answer the research questions. The study employed a multi-variate secondary analysis design on secondary data since the data analysis involves investigating two or more levels of analysis before deriving conclusions. The objective of the secondary analysis was to identify the trends in education success measures by equity groups within the IPEDS 2017-2021 data set and identify the statistically significant variables associated with education success measures.

Chapter Three: Methods

Overview

There was a dual problem of interest in this study. Although blended learning and online courses in higher education allow for increased access, there is evidence that students within vulnerable groups face barriers to achieving academic success in blended and online learning environments (Castelli & Sarvary, 2021; Joosten & Cusatis, 2020; Mishra, 2020). Due to this challenge, there is a need to examine the trends in success measures by vulnerable student groups, referred to in this study as equity groups, to identify areas to improve equity in student achievement. There remains a need to improve equity by researching the factors that relate to inequities in student outcomes (Castelli & Sarvary, 2021; de Brey et al., 2019; Mishra, 2020). Additionally, given evidence on inequity in online education (Joosten & Cusatis, 2020), additional research is needed on the role of online education, compared to blended learning or in-person modalities, as related to issues of inequity in student outcome measures.

The purpose of this secondary analysis study was to explore the trends in academic success measure scores by equity group within the IPEDS 2017 – 2021 data. An additional aim of this study was to investigate the role of course modality in relation to success measure scores. The study is based on the need to improve equity in academic achievement among students in light of the different instruction modalities and the demographic factors of age, gender, and race. To achieve this objective, the researcher focused on unearthing how modalities of instruction and demographic factors impact various metrics of student success. As indicated by Chaudhary (2017), demographic factors such as age, gender, race, and income or socioeconomic status as measured by financial aid have been found to influence the academic achievement of students, leading to inequalities in student outcomes. Furthermore, S. Maxwell, Reynolds, et al. (2017)

indicated that the in-person, online, and hybrid instructional modalities, apart from having different influences with regard to student achievement, have been associated with inequalities in matters related to student outcomes.

Research Questions

The study was guided by the following research questions.

- RQ1: What are the trends in academic success measures by equity groups within the IPEDS 2017 – 2021 data?

- RQ2: What, if any, statistically significant relationships exist between demographic and teaching modality variables?

Research Methodology

A quantitative methodology was applied to explore the trends in success measure scores by equity group within the IPEDS 2017 – 2021 data as well as to investigate the role of course modality in relation to success measure scores. The quantitative research methodology was chosen partly due to the large quantity of secondary data that is targeted for this research. Methodology scholars such as Creswell and Creswell (2018) and Lodico et al. (2006) indicated that a quantitative research approach is suitable for studies that involve a large quantity of data, such as this study, which entailed analysis of IPEDS 2017 – 2021 data. Within this existing dataset, the researcher focused on trends from 2017 to 2021 in success measure scores by equity group comprising vulnerable students across the United States. Accordingly, this study involved a large amount of data, justifying why the quantitative research methodology was selected. The quantitative research methodology is also applied to determine averages, patterns, and trends (Gupta & Gupta, 2022). This further justifies why a quantitative research methodology was selected since one of the aims of this study was to explore the trends in success measure scores

by equity group within the IPEDS 2017 – 2021 data. A quantitative research approach is also employed in measuring the association between variables under investigation (Ahmadin, 2022). The second key aim of this study was to investigate the role of course modality in relation to success measure scores. Specifically, the study focused on how online, in-person, and blended learning/hybrid instruction modalities, as well as the demographic factors of age, gender, race, and income as measured by financial aid, relate to success measure scores. The point that the arithmetical findings attained via quantitative approaches could provide pertinent data to investigate the role of online, in-person, and blended learning/hybrid instruction modalities and demographic factors of age, gender, race, and income as measured by success measure scores resulted to the selection of the quantitative research methodology.

Research Design

As described by Fellows and Liu (2015), a research design is a framework of techniques and approaches adopted in integrating diverse research components to answer research questions. The research design that was selected for this study was a Secondary Analysis. As indicated by Gray (2021), the secondary analysis approach is expedient in cases where the researcher needs to take into account a large existing dataset and undertake analysis to determine different trends. Moreover, the approach is best suited in cases where researchers need to carry out studies that are related to real-world occurrences that span over periods of time exceeding 2 years (Gray, 2021). As such, the secondary analysis approach was deemed useful in the current study given that the researcher focused on analyzing trends in success measure scores by equity group within the IPEDS 2017 – 2021 data. From such a perspective, the utilization of the Secondary Analysis design makes it possible to achieve the objectives of this study.

As indicated by Trochim (2006), secondary analysis is built on the premise that secondary data is the foundation for real-world evidence spanning a specific time duration, which allows for the examination of trends. As such, while using the secondary analysis approach, the researcher was able to leverage findings obtainable from the IPEDS 2017 – 2021 data, being able to access a volume of data that would have simply been impossible for the researcher to amass. More importantly, reanalyzing the IPEDS 2017 – 2021 data made it possible for the researcher to come up with new understandings and points of view as well as relevant conclusions that can be related to real-world experiences (Gray, 2021).

Positionality Statement

As a college instructor, I have experience regarding the influence of online and hybrid learning modes on student success. I acknowledge the potential influence of my position and experiences on the outcomes of this research. My experiences in higher learning provide me with rich knowledge about the educational environment, particularly the challenges and benefits students face in the higher learning landscape. I recognize the need to mitigate potential biases stemming from my experiences in the higher learning landscape. To address potential bias, I adopted an objective and balanced approach while carrying out the study. My experiences were leveraged to inform the research process, and I refrained from using my personal experiences to unduly influence data interpretation and framing of study conclusions. The reflexive approaches included maintaining a reflexive journal during the entire research process to document assumptions and personal bias and provide a reflection on how they might influence the interpretation of findings. Peer debriefing involved engaging neutral persons to provide their interpretation of the data and findings.

Furthermore, I employed rigorous methodologies in conducting the study to achieve objective and unbiased outcomes. These include using robust quantitative analyses of secondary data to achieve reliable and valid study findings. The choice of IPEDS, which is considered a reliable database, mitigated the potential bias in the data used in this study. I also engaged in critical reflection to address any potential biases that could be attributed to my experiences in the higher learning environment. Finally, I endeavor to contribute significantly and objectively to understanding the impacts of demographic variables and learning modes on students' success in higher learning, thereby conforming that the outcomes of this study are grounded in empirical evidence and not influenced by my experiences in higher learning education.

Source of Data

The general population for the IPEDS data comprises all postsecondary institutions in the United States. According to the NCES (2022), 6,642 postsecondary learning institutions in the United States participated in the IPEDS survey in the academic period 2017-2018. This existing dataset was selected because the goal of this study was to explore trends and examine relationships among the demographic variables, teaching modalities, and academic success measures in postsecondary students within vulnerable groups. The targeted subset of data includes those students who are designated by NCES as being part of certain equity groups.

The data were sourced from the Integrated Postsecondary Education Data System (IPEDS), which is compiled by the NCES. NCES is the primary federal entity for collecting and analyzing data related to education in the U.S. and other nations and fulfills a Congressional mandate to collect, collate, analyze, and report complete statistics on the condition of American education; conduct and publish reports, and review and report on education activities internationally. IPEDS comprises institutional-level data from providers of postsecondary

learning in the U.S., including all 50 states, the District of Columbia, and other U.S. jurisdictions like the U.S. Virgin Islands (NCES, 2022). IPEDS is a solitary, broad program, which is designed around a sequence of interconnected survey elements developed to gather institution-level data in areas such as enrollment, admissions, tuition and fees, student monetary assistance (i.e., financial aid), library information, finances, course completions, student retention rates, student graduation rates, and other outcome measures. IPEDS surveys are performed annually by postsecondary institutions, and the data is compiled by NCES. Postsecondary institutions that participate in IPEDS surveys are those that are eligible to participate in any federal student monetary aid initiative accredited by Title IV of the Higher Education Act of 1965. Participation in IPEDS surveys is voluntary for postsecondary institutions that are eligible to participate in Title IV programs. IPEDS surveys have been collected and compiled annually since 1993.

The IPEDS survey instrument has 12 components that are separated into one of the three seasonal reporting times, including spring, fall, and winter. The spring collection comprises academic libraries (AL), human resources (HR), fall enrollment (EF), and finance (F) survey components. The winter data includes the admissions (ADM), student financial aid (SFA), outcome measures (OM), 200% graduation rates (GR200), and graduation rates (GR) survey components. Lastly, the fall data collection comprises the 12-month enrollment (E12), completions (C), and institutional characteristics (IC) survey components. The IPEDS survey is a web-centered collection, which is referred to as the IPEDS Data Collection System (DCS). When institutions or state agencies upload data, the DCS automatically computes totals, percentages, and averages and also compares the observations with the previous year's submitted data for the same entity to make sure that the data are consistent.

The IPEDS survey instrument can be regarded as valid because it has been applied to collect postsecondary education institutions' data since 1993, with significant modifications over time to improve it and integrate emerging aspects of higher education learning. To justify its validity further, the IPEDS survey instrument has been approved by NCES, which is the federal government agency tasked with the collection, analysis, and dissemination of data linked to education in the United States and other countries. The instrument has also been approved for use in the gathering of postsecondary education data by postsecondary education institutions across the United States. Data gathered through the IPEDS survey can be considered valid and reliable based on the level of institutional reporting and follow-up screenings that are done on this data. The IPEDS data is required to clear and lock the data submission. More quality control edits are performed on the data before the data is released. After submitting the data, representatives of postsecondary education institutions and/or state agencies lock the data so that it cannot be altered. Further, since all IPEDS data are substantiated as precise from the postsecondary education institutions and/or state agencies, the data is free from biases.

The goal of IPEDS is to gather institution-level data from postsecondary learning providers, predominantly all Title IV-eligible colleges and universities, as well as technical and vocational learning providers across the United States. The targeted participants, vulnerable student groups, are more likely to enroll in postsecondary institutions that participate in federal student financial aid programs. The decision to apply secondary data retrieved from IPEDS was also based on past studies that utilized the IPEDS data, such as Dahlvig et al. (2020) and Romine et al. (2018). Past researchers have considered the application of IPEDS data since it provides a comprehensive dataset for the needed variables. For this study, the independent variables included demographic variables (gender, age, race, and income as measured by financial aid), the

program type (associates, bachelor's, and certificates), and modality (online, in-person, and blended learning/hybrid). The choice of gender, age, race/ethnicity, and socioeconomic status as demographic variables for this analysis was informed by their extensive documentation in scholarly works on the academic success of students within higher education (Alhajraf & Alasfour, 2014; Casanova et al., 2005; El Refae et al., 2021; Nawa et al., 2020). These factors are deemed relevant due to their close links to students' performance across diverse educational settings. The dependent variables comprised academic outcome/success measured by the number of students receiving awards/degrees. Table 1 shows how each variable is measured and operationalized in the IPEDS dataset. All these variables are accessible and comprised of the IPEDS data. This study only focused on IPEDS 2017–2021 data.

Human Subjects Considerations

Gathering a dataset for analysis from the publicly available IPEDS website involves no risks to any individual respondents since only summary data collected from institutions rather than individual respondents is involved. As such, the study qualifies as non-human subject research according to Federal Regulations for human subject research (45 CFR 46). Furthermore, no permission is needed to access and use the data since IPEDS data is publicly released and can be accessed via the IPEDS data center or NCES website by postsecondary learning institutions and the public in general. The request to carry out the study was submitted to the University IRB for their determination and approval to carry out the non-human subject research.

Data Collection Strategies & Procedures

This study focused on IPEDS data gathered between 2017 and 2021. This selection was determined considering when the widespread use of diverse education modalities, including

online and blended learning/hybrid modalities during the COVID-19 pandemic, became common

practice.

Table 1

Measurement and Operationalization of the Study Variables

Variable	Definition of the Variable	Indicator	Category of Data	Measure
Gender	Gender refers to the features of men, women, boys, and girls that are socially created (NCES, 2022).	Male Female	Nominal	Type of gender
Age	Age is the overall time in which a human being or thing has existed (NCES, 2022).	Date of birth	Ratio	Number of years
Race	The race is an individual's self-identification with one or more social groups (NCES, 2022).	-Native American/American -Indian -Asian American -Black -Hispanic/Latino -White	Nominal	
Income	Income is the amount of money, property, and other transfers of value attained over time in exchange for products or services (NCES, 2022).	Financial aid	Ratio	Financial aid
Online learning modality	Online learning refers to any form of learning and/or teaching that takes place via a computer network (Altindag et al., 2021).		Nominal	
In-person learning modality	In-person learning refers to any form of instructional interaction that occurs 'in person' and face to face, and in real time between teachers and students or among colleagues and peers (H. Lei et al., 2018).		Nominal	
Blended learning/hybrid modality	Blended learning connotes a learning method with more than one delivery mode being used to optimize learning outcomes and reduced the cost associated with program delivery (O'Keefe et al., 2020). The term also refers to any mix of instructor-led training methods with technology-based learning (O'Keefe et al., 2020).		Nominal	
Associates Program	An associate's degree is an academic program taken at the undergraduate educational stage which is the first postsecondary learning stage (NCES, 2022).		Nominal	
Bachelor's program	A bachelor's program is an undergraduate degree where individuals study subjects of their choice at a postsecondary learning institution (NCES, 2022).		Nominal	
Certificate Program	A certificate program is a postsecondary learning program used mostly to bridge the gap between diverse stages of education study or to offer additional qualifications and professional training (NCES, 2022).		Nominal	
Academic outcome/success	Academic outcome/success is an assessment of student's academic performance based on their institutions' projections (Sellami et al., 2017).	Completions Graduation rates	Nominal	Numbers, proportions

Note: The variables table showing how study variables are measured and operationalized. These variables include demographic variables, instruction modalities, high education learning programs, and education success.

No permission is needed to access and use the data since IPEDS data is publicly released and can be accessed via the IPEDS data center or NCES website by postsecondary learning institutions and the public in general. Gathering this data involves no risks to any individual respondents since the IPEDS data includes only summary data collected from institutions rather than individual respondents.

The analysis unit is an institution's summary measure of each of the variables of the study. This means that the dataset aggregates information for each institution into a condensed summary represented by statistical measures such as means, medians, and counts. The number of rows in the IPEDS dataset directly corresponds to the number of institutions for the summarized data available within the IPEDS database, and the column corresponds to each variable. Data was extracted for all eligible institutions represented in the rows against variables in the column for each of the five years under consideration. The IPEDS data were downloaded from the NCES website for each year into Microsoft ("MS") Excel format, providing an MS Excel file for each of the five targeted years: 2017, 2018, 2019, 2020, and 2021. A new MS Excel file was created comprising columns for year, variables, and success scores in preparation for import into a statistical analysis software program.

All data posted on the NCES website are considered clean and legally reported. IPEDS data are submitted by postsecondary education institutions or by state agencies on behalf of postsecondary education institutions via a web-centered data-gathering program. Interactive edits are performed via the data collection program, and the data provided is required to clear and lock the submission. More quality control edits are performed on the data before the data is released.

Clean, complete data comprising the required variables were imported into SPSS software for

analysis. SPSS was selected because it facilitates quality graphing and plotting and hence

provided ideal trends for success measure scores by equity group within the IPEDS 2017 – 2021

data.

Data Preparation

The IPEDS data were downloaded from the NCES website for each year into Microsoft

("MS") Excel format, providing an MS Excel file for each of the five targeted years: 2017, 2018,

2019, 2020, and 2021. MS Excel file comprised columns for the year, variables, and success

scores in preparation for import into a statistical analysis software program. To prepare the data

for the analysis, for each of these data sets, the data for the years 2017-2021 were matched based

on the column UNITID. The assumptions of ANOVA statistical tests were assessed to determine

their appropriateness in performing statistical analysis. These include normality of the dependent

variable, independence of observations, and homoscedasticity.

The distribution of dependent variables of academic success (measured by number of

degrees awarded) was performed using graphical methods of box plots, which revealed no

outliers and a normal distribution shape. Homogeneity of variances was tested using Levene's

test to examine whether variances across groups are equal. It is hypothesized that variances are

homogenous, and a significant p value indicates the absence of homogeneity. Durbin-Watson test

was used to assess the independence of observation in time series data. Listwise deletion was

applied to cases with missing values to ensure that only complete cases were included in the

statistical analyses. Given the large sample size used in this study, all cases with missing data

were excluded from the study. An ad hoc test of Bonferroni correction was to be used in

ANOVA if the findings were significant to determine which specific groups differ from each other.

Data Analysis

Data analyses was conducted using the Statistical Package for the Social Sciences (SPSS). Initial data analyses included frequencies, percentages, means, and standard deviations to summarize the overall results (Denis, 2018).

The first step in analyzing data involved an accurate definition of the SPSS analysis path to help analyze the descriptive statistics based on the study variables. According to Pallant (2020), this phase is critical because it provides statistics and graphical displays that are useful for describing many types of variables. For instance, the researcher utilized the SPSS software to help answer the research questions due to the availability of variables at different levels, encompassing the program type (associates, bachelor, and certificates) and modality (online, in-person, and blended learning/hybrid) as well as due to the complexity between the variables under investigation on diverse levels. As indicated by Denis (2018), this step is useful in that it displays univariate summary statistics for several variables in a single table and calculates standardized values. The second phase involved the exploration procedure, which generated summary statistics and graphical displays for the subgroups. Particularly, this phase encompassed data screening, outlier identification, description, assumption checking, and characterizing differences among the subgroups (Talib & Sulieman, 2022).

The third step involved analyzing and comparing means. According to Kent (2020), the means comparison procedure calculates subgroup means and related univariate statistics for dependent variables within categories of one or more independent variables. This paved the way for the final step, which was the use of repeated analysis of variance (ANOVA) to compare

group responses based on demographic variables (gender, age, race, and income as measured by financial aid), the program type (associates, bachelor, and certificates), and modality (online, in-person, and blended learning/hybrid). In the analysis, the focus was to determine the role of demographic variables and modality as related to academic success measures, including completion and graduation rates. The repeated measures ANOVA was utilized to provide insights into the trends and shifts in academic program offerings and modalities over time, highlighting any significant changes in the educational landscape of postsecondary institutions in the United States. To successfully perform the ANOVA analysis, there has to be a sufficient sample size, and the sample must be random. The first assumption has been met because the sample for this study comprised data from all postsecondary education institutions in the U.S. that was collected in IPEDS surveys for 5 years between 2017 and 2021. The second assumption has been met since the secondary data from IPEDS surveys is from a representative, random sample. Other assumptions necessary for conducting ANOVA analysis, including independence, linearity, normality, and homoscedasticity, were tested before data analysis. The actual ANOVA analysis was performed because the datasets met the four assumptions. All ANOVA results were evaluated at an alpha level equal to 0.05 for statistical significance (Edmonds & Kennedy, 2017). Where p value is less than 5% implies that independent variables have a significant impact on the dependent variable (academic success). However, if p value is greater than 5%, the effects of independent variables on the dependent variable are not significant.

Means to Ensure Study Validity

The validity of a study refers to how suitably the findings among the research subjects represent true results among comparable persons outside the study (Patino & Ferreira, 2018). Validity is further categorized into external validity and internal validity. According to Ewoldsen

(2022), external validity refers to how the research findings can be replicated utilizing a different sample at a different time. The findings of this study may be replicable to other settings and periods because the secondary data of interest relates to all postsecondary education institutions in the U.S. IPEDS comprises institutional-level data from providers of postsecondary learning in the U.S., including all 50 states, the District of Columbia, and other U.S. jurisdictions like the U.S. Virgin Islands. Internal validity, on the other hand, is the level at which the achieved findings represent the truth in the population under assessment rather than methodological inaccuracies (Patino & Ferreira, 2018). Andrade (2018) adds that internal validity is the rigor of the research design and the measurement with which the study was performed.

The key threats to internal validity include instrumentation, selection bias, and testing (Mueller & Knapp, 2018). Because this study was based on secondary data retrieved from IPEDS, the researcher relied on original measures applied by IPEDS to ensure the data was collected from relevant subjects as well as to mitigate instrumentation, selection bias, and testing threats of internal validity. Regarding instrumentation, the IPEDS survey instrument can be considered valid because it has been used to collect postsecondary education institutions' data since 1993, with significant modifications over time to improve it and integrate emerging aspects of higher education learning. To justify its validity further, the IPEDS survey instrument has been approved by NCES, which is the federal government agency tasked with the collection, analysis, and dissemination of data linked to education in the United States and other countries. The instrument has also been approved for use in the gathering of postsecondary education data by postsecondary education institutions across the United States. IPEDS data are submitted by postsecondary education institutions and/or by state agencies on behalf of postsecondary education institutions via a web-centered data-gathering program. Since postsecondary education

institutions or state agencies are bound by law to report truthful data based on the stipulated descriptions of each variable, the researcher considers the IPEDS data to be accurate. Additionally, interactive edits are performed via the data collection program, and the data provider is required to clear and lock the data submission. More quality control edits are performed on the data before the data is released. After submitting the data, representatives of postsecondary education institutions and/or state agencies lock the data so that it cannot be altered. These considerations meant that threats to internal validity in this study would be minimal.

Plan for Reporting Findings

The study findings are reported in Chapter 4, which includes a detailed analysis of the demographic factors and instruction modalities influencing academic success measures in the postsecondary education system. Subsequently, the study summary, conclusions, implications, and recommendations were presented in Chapter 5.

Chapter Four: Results

This chapter presents a detailed analysis of the factors influencing academic success measures in the United States postsecondary education system, as explored in the Integrated Postsecondary Education Data System (IPEDS) data from 2017 to 2021. The focus is on understanding the impact of demographic variables (race and gender) and teaching modalities (traditional vs. distance education) on academic success (awards and degrees received). This analysis aligns with the study's objective to identify factors associated with inequities in success measure scores and investigate the role of teaching modality in academic success measures, as delineated in the first three chapters. The following research questions guided this study:

- RQ1: What are the trends in academic success measures by equity groups within the IPEDS 2017 – 2021 data?

- RQ2: What, if any, statistically significant relationships exist between demographic and teaching modality variables?

A series of repeated-measures ANOVA was utilized to address these questions. This chapter is structured as follows. Firstly, the descriptive statistics performed to characterize this study's collected data are presented. Secondly, the results of the repeated-measures ANOVAs and evaluations of the research questions are provided. Finally, a summary of the findings is discussed to conclude the chapter.

Descriptive Statistics

The data analyzed in this study was derived from the IPEDS, a comprehensive dataset containing information on various aspects of postsecondary education from every college, university, and technical and vocational institution that participates in the federal student financial aid programs. The information in the IPEDS dataset includes but is not limited to

institutional characteristics, financial aid, academic programs, and student outcomes, among

others. For this study, the specific details that were extracted from the IPEDS dataset were the

number of students receiving degrees categorized by race, gender, and teaching modality

(traditional vs. distance education) from 2017 to 2021. After data extraction, each data set was

organized to match the data for the years 2017-2021 based on the column UNITID. Listwise

deletion was applied to cases with missing values to ensure that only complete cases were

included in the statistical analyses.

Table 2

Programs Offered at School from 2017 to 2021 (N = 5,740)

Variables	Min	Max	*Mean*	*SD*
Number of programs offered	3	2,052	132.50	197.46
Number of associate's degree programs offered	0	366	23.69	51.03
Number of bachelor's degree programs offered	0	741	42.07	79.79
Number of master's degree programs offered	0	810	21.47	59.15
Number of doctor's degree-research/scholarship programs offered	0	465	6.32	30.86
Number of doctor's degree-professional practice programs offered	0	69	1.05	3.78
Number of doctor's degree-other programs offered	0	27	.12	1.01
Number of 1-year, but less than-2-year certificate programs offered	0	279	13.51	26.01
Number of 2-year, but less than 4-year certificate programs offered	0	93	.98	4.63
Number of postbaccalaureate certificate programs offered	0	327	5.88	21.994
Number of post-master's certificate programs offered	0	381	2.30	12.04

The descriptive statistics, including the minimum, maximum, mean, and standard

deviations for the offered courses from 2017 to 2021, are presented in Table 2. There were 5,740

observations, or schools for this study, in the data set. The number of programs offered in the

selected sample of schools ranged from three to 2,052 (*Mean* = 132.50, *SD* = 197.46). On

average, schools offer more bachelor's degree programs (*Mean* = 42.07, *SD* = 79.79), followed

by associate's degree programs (*Mean* = 23.69, *SD* = 51.03) and master's degree programs

(*Mean* = 21.47, *SD* = 59.15).

The descriptive statistics of mean and standard deviation for the number of programs offered and number of students receiving awards/degrees by race/ethnicity and gender are presented in Tables 3 and 4, respectively. As can be seen in Table 3, a steady increase in the mean number of associate's degree programs offered was observed, from 22.405 ($SD = 47.580$) in 2017 to 23.690 ($SD = 51.034$) in 2021. The mean number of associate's degree programs offered via distance education showed a similar upward trend from 2.699 ($SD = 8.803$) in 2017 to 3.070 ($SD = 10.313$) in 2019 but dipped down after. The mean number of bachelor's degree programs offered rose from 39.283 ($SD = 75.056$) in 2017 to 42.073 ($SD = 79.788$) in 2021. Similar to the mean number of associate's degree programs offered via distance education, the mean number of bachelor's degree programs offered via distance education showed an upward trend from 3.249 in 2017 ($SD = 12.038$) to 3.772 ($SD = 12.276$) in 2019 but decreased thereafter.

Furthermore, the mean number for 1-year but less than 2-year certificate programs offered had a consistent increase from 12.800 ($SD = 24.725$) in 2017 to 13.515 ($SD = 26.008$) in 2021. However, the mean number for 1-year but less than 2-year certificate programs offered via distance education steadily increased from 0.927 ($SD = 3.690$) in 2017 to 1.028 ($SD = 3.966$) in 2019 and went downwards after. On the other hand, the mean number for 2-year but less than 4-year certificate programs offered kept on fluctuating during the 5 years, whereas the mean number of the same certificate program offered via distance education showed a downward trend from 0.042 ($SD = 0.810$) in 2017 to 0.035 ($SD = 0.741$) in 2021.

The mean number of doctor's degree programs for professional practice and research/scholarship showed an increasing trend from 2017 to 2021 but not for other programs, which increased only from 2017 to 2019. Meanwhile, the mean number of three different doctor's degree programs offered via distance education showed no evident pattern from 2017 to

2021. Furthermore, the number of master's degree and postbaccalaureate certificate programs offered consistently increased over the years. Similarly, the postbaccalaureate certificate programs offered via distance education saw an upward trend from 1.029 (*SD* = 5.992) in 2017 to 1.485 (*SD* = 7.743) in 2021. Finally, the total number of programs offered steadily rose from 121.762 (*SD* = 179.552) in 2017 to 132.501 (*SD* = 197.461) in 2021. An increase in programs offered via distance education was identified only from 14.013 (*SD* = 37.227) in 2017 to 16.240 (*SD* = 38.656) in 2019.

Table 4 presents the descriptive statistics for the number of students receiving awards/degrees by race/ethnicity and gender from 2017 to 2021. Collectively, the mean number of awards and degrees for men was 328.555 (*SD* = 744.934) in 2017, which increased to 335.597 (*SD* = 832.469) in 2021, while for women, was 459.591 (*SD* = 985.879) in 2017 which increased to 508.336 (*SD* = 1220.250) in 2021. In more detail, the mean number of students awarded or graduated among American Indian or Alaska Native men was 1.938 (*SD* = 7.379) in 2017, which decreased to 1.738 (*SD* = 7.788) in 2021, while among American Indian or Alaska Native women, was 2.998 (*SD* = 11.293) in 2017 which increased to 3.156 (*SD* = 13.717) in 2021. For Asian men, the mean number of awards and degrees was 20.146 (*SD* = 84.731) in 2017, which increased to 23.198 (*SD* = 98.681) in 2021, while among Asian women, it was 25.832 (*SD* = 97.591) in 2017, which increased to 31.234 (*SD* = 117.324) in 2021.

Table 3

Descriptive Statistics for the Number of Programs Offered and the Number of Programs Offered via Distance Education

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Number of associate's degree programs offered	22.405	47.580	22.678	48.066	23.000	48.811	23.345	50.102	23.690	51.034

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Number of associate's degree programs offered via distance education	2.699	8.803	2.937	9.652	3.070	10.313	2.506	9.335	2.593	9.329
Number of bachelor's degree programs offered	39.283	75.056	40.007	76.041	41.074	77.847	41.781	79.191	42.073	79.788
Number of bachelor's degree programs offered via distance education	3.249	12.038	3.498	11.931	3.772	12.276	2.747	11.260	2.639	11.198
Number of 1-year, but less than-2-year certificate programs offered	12.800	24.725	13.129	25.169	13.286	25.520	13.491	25.858	13.515	26.008
Number of 1-year, but less than 2-year certificate programs offered via distance education	0.927	3.690	0.999	3.896	1.028	3.966	0.887	3.528	0.962	3.819
Number of 2-year, but less than 4-year certificate programs offered	1.006	4.503	1.010	4.566	1.004	4.648	0.953	4.419	0.975	4.626
Number of 2-year, but less than 4-year certificate programs offered via distance education	0.042	0.810	0.042	0.736	0.040	0.754	0.037	0.732	0.035	0.741
Number of doctor's degree-other programs offered	0.109	0.964	0.117	1.015	0.119	1.024	0.116	0.930	0.124	1.007
Number of doctor's degree-other programs offered via distance education	0.018	0.293	0.021	0.331	0.026	0.362	0.023	0.349	0.027	0.403
Number of doctor's degree-professional practice programs offered	0.859	3.229	0.906	3.414	0.949	3.533	1.002	3.653	1.052	3.777
Number of doctor's degree-professional practice programs offered via distance education	0.113	0.890	0.117	0.801	0.130	0.839	0.104	0.764	0.122	0.877
Number of doctor's degree-research/scholarship programs offered	5.857	29.690	5.953	29.779	6.071	30.071	6.228	30.645	6.320	30.864
Number of doctor's degree-research/scholarship programs offered via distance education	0.313	4.063	0.305	3.063	0.345	3.139	0.269	3.056	0.292	3.089

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Number of master's degree programs offered	19.573	55.040	20.073	56.102	20.489	56.827	21.040	58.135	21.472	59.154
Number of master's degree programs offered via distance education	3.883	12.929	4.125	12.724	4.476	13.598	3.449	11.973	3.535	12.110
Number of postbaccalaureate certificate programs offered	3.946	15.952	4.395	17.431	4.721	18.376	5.411	20.476	5.883	21.994
Number of postbaccalaureate certificate programs offered via distance education	1.029	5.992	1.164	6.245	1.328	6.846	1.350	7.326	1.485	7.743
Number of post-master's certificate programs offered	1.933	11.090	2.049	11.585	2.115	11.488	2.212	11.752	2.303	12.036
Number of post-master's certificate programs offered via distance education	0.361	3.178	0.383	2.582	0.428	2.915	0.364	2.495	0.382	2.316
Number of programs offered	121.762	179.552	125.032	184.362	128.297	188.288	128.694	191.663	132.501	197.461
Number of programs offered via distance education	14.013	37.227	15.088	36.138	16.240	38.656	13.035	35.540	13.657	36.981

Table 4

Descriptive Statistics for No. of Students Receiving Awards/Degrees by Race/Ethnicity & Gender

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
American Indian or Alaska Native men	1.938	7.379	1.957	8.830	1.882	7.587	1.777	7.055	1.738	7.788
American Indian or Alaska Native women	2.998	11.293	3.064	11.703	3.133	11.752	3.005	11.655	3.156	13.717
American Indian or Alaska Native total	4.936	18.068	5.021	19.348	5.015	18.581	4.782	18.048	4.893	20.796
Asian men	20.146	84.731	21.179	88.289	21.922	90.994	22.574	94.959	23.198	98.681
Asian women	25.832	97.591	27.338	101.741	28.635	106.174	29.444	110.961	31.234	117.324
Asian total	45.978	180.722	48.518	188.141	50.558	195.215	52.018	204.052	54.432	214.091

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Black or African American men	30.335	78.751	30.758	78.533	31.245	79.979	30.651	80.534	31.224	86.652
Black or African American women	56.486	164.102	58.123	169.670	60.094	171.292	59.834	173.463	64.364	195.458
Black or African American total	86.821	236.600	88.880	239.975	91.338	243.398	90.484	246.201	95.588	272.124
Hispanic or Latino men	45.297	142.445	48.009	152.243	50.858	161.580	52.572	173.967	53.791	179.943
Hispanic or Latino women	71.151	216.423	75.584	228.395	81.093	247.547	84.831	273.167	91.993	296.835
Hispanic or Latino total	116.448	353.913	123.593	374.819	131.951	404.057	137.404	442.411	145.785	471.365
Native Hawaiian or Other Pacific Islander men	0.892	4.141	0.898	4.415	0.911	4.288	0.862	4.196	0.845	3.900
Native Hawaiian or Other Pacific Islander women	1.223	6.236	1.241	6.443	1.262	6.822	1.235	6.482	1.289	6.537
Native Hawaiian or Other Pacific Islander total	2.114	10.134	2.139	10.514	2.173	10.822	2.096	10.388	2.134	10.150
Nonresident alien men	27.075	124.834	27.552	129.098	27.106	129.322	27.345	137.304	25.954	131.180
Nonresident alien women	22.174	100.123	23.459	109.431	23.570	111.403	23.848	117.499	22.981	110.078
Nonresident alien total	49.249	221.594	51.011	235.425	50.675	237.411	51.193	250.681	48.935	237.735
Race/ethnicity unknown men	14.628	66.237	14.091	63.561	14.369	63.927	14.010	65.129	14.377	69.862
Race/ethnicity unknown women	19.265	95.738	18.446	89.225	19.598	93.968	19.898	100.867	21.185	114.345
Race/ethnicity unknown total	33.893	158.084	32.536	149.005	33.967	153.343	33.908	160.252	35.562	179.716
Two or more races men	8.652	23.968	9.311	25.000	10.033	26.586	10.486	28.191	10.784	29.206
Two or more races women	13.076	34.415	14.182	36.228	15.324	38.003	16.257	40.915	17.291	43.711
Two or more races total	21.728	57.456	23.494	60.245	25.357	63.454	26.743	68.076	28.074	71.832
White men	179.591	411.134	179.899	419.223	179.677	425.167	175.583	434.208	173.687	443.756
White women	247.386	540.496	249.098	565.180	251.526	593.144	250.471	629.818	254.843	654.968
White total	426.978	932.104	428.997	961.532	431.204	995.588	426.054	1040.658	428.530	1075.237

Variable	Year 2017		Year 2018		Year 2019		Year 2020		Year 2021	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Grand total men	328.555	744.934	333.654	767.210	338.004	783.019	335.859	808.553	335.597	832.469
Grand total women	459.591	985.879	470.534	1025.765	484.235	1074.524	488.823	1142.205	508.336	1220.250
Grand total	788.146	1696.565	804.188	1753.117	822.238	1818.098	824.683	1910.221	843.933	2008.954

The mean number of students awarded or graduated among Black or African American men was 30.335 (SD = 78.751) in 2017, which increased to 31.224 (SD = 86.652) in 2021, while for Black or African American women was 56.486 (SD = 164.102) in 2017 which increased to 64.364 (SD = 195.458) in 2021. Moreover, for Hispanic or Latino men, the mean number of awards and degrees was 45.297 (SD = 142.445) in 2017, which increased to 53.791 (SD = 179.943) in 2021, while for Hispanic or Latino women was 71.151 (SD = 216.423) in 2017 which increased to 91.993 (SD = 296.835) in 2021. For Native Hawaiian or Other Pacific Islander men, the mean number of awards and degrees was 0.892 (SD = 4.141) in 2017, which decreased to 0.845 (SD = 3.900) in 2021; while for Native Hawaiian or Other Pacific Islander women was 1.22 (SD = 6.236) in 2017 which increased to 1.289 (SD = 6.537) in 2021.

The mean number of students awarded or graduated among nonresident alien men was 27.075 (SD = 124.834) in 2017, which decreased to 25.954 (SD = 131.180) in 2021, while for nonresident alien women was 22.174 (SD = 100.123) in 2017 which decreased to 22.981 (SD = 110.078) in 2021. In addition, for men with unknown race/ethnicity, the mean number of awards and degrees was 14.628 (SD = 66.237) in 2017, which decreased to 14.377 (SD = 69.862) in 2021, while for women with unknown race/ethnicity was 19.265 (SD = 95.738) in 2017 which increased to 21.185 (SD = 114.345) in 2021. For people with men with two or more races, the mean number of awards and degrees was 8.652 (SD = 23.968) in 2017, which increased to 10.784 (SD = 29.206) in 2021, while for women with two or more races was 13.076 (SD =

34.415) in 2017 which increased to 17.291 (SD = 43.711) in 2021. Lastly, the mean number of

awards and degrees for White men was 179.591 (SD = 411.134) in 2017, which decreased to

173.687 (SD = 443.756) in 2021, while for White women, it was 247.386 (SD = 540.496) in

2017, which increased to 254.843 (SD = 654.968) in 2021.

Answering the Research Questions

This section presents the results for each research question. To evaluate the questions, it

was examined whether observed changes in the variables from 2017 to 2021, as indicated in

Tables 3 and 4, were statistically significant. For this purpose, a series of repeated measures

ANOVA were conducted. This statistical test is an ideal procedure to evaluate whether there are

significant differences across multiple points in time (Tabachnick & Fidell, 2013). This analysis

was performed to assess the mean differences in the number of students receiving

awards/degrees, the number of programs offered, and the number of programs offered via

distance education across the five years for different demographic variables. By considering

within-subjects factors, the repeated measures ANOVA was utilized to provide insights into the

trends and shifts in academic program offerings and modalities over time, highlighting any

significant changes in the educational landscape of postsecondary institutions in the United

States.

Assumptions Testing

The assumptions of the repeated measures ANOVA were tested prior to conducting the

analyses. Repeated measures ANOVA includes five assumptions to satisfy. These assumptions

are presented as follows:

Continuous Dependent Variable. For the first research question, the dependent variable

is the academic success variables across different demographic groups and across the years.

Academic success was measured as a continuous variable of the number of students who

succeeded for each demographic group for a specific year. For the second research question, the

dependent variable was the number of programs offered, which was also measured using a

continuous scale to determine the number of programs offered for each program type. Therefore,

the assumption on using continuous dependent variables for the repeated measures ANOVA was

achieved.

Independent Variables Should Consist of At Least Two Categorical or Matched

Pairs. The second assumption is that the independent variable should be measured with the same

subjects two or more times. In the case of this study, for both the first and the second research

questions, the independent variables are the categories of demographic characteristics and

programs offered measured for each year from 2017 to 2021. Therefore, the assumption on the

independent variable is met for both research questions.

Independence. The third assumption for repeated measures ANOVA is that the

observations are independent. In the case of this study, the measures were taken for each year

from 2017 to 2021. Therefore, the observations were unrelated and are independent of each

other. The assumption is met for both Research Questions 1 and 2.

Normality. The fourth assumption of repeated measures ANOVA is the normality of

data. Typically, Shapiro-Wilk's test is used to determine whether the data is normally distributed.

The results of the Shapiro-Wilk's test determined that the variables are not normally distributed

with significance values lower than .05. However, the sample size for this study was large, with

5,679 samples for academic success and 5,740 samples for programs offered. Therefore,

violations in normality are less relevant, and it is assumed that the assumption of normality is

met.

Sphericity. The assumption on sphericity is that the variances of the differences between all combinations of related groups must be equal. Mauchly's sphericity test is utilized to determine whether the assumption is violated. Mauchly's test revealed significant deviations from this assumption for all variables. To correct the violation in assumption, the Greenhouse-Geisser correction was utilized to ensure that the F statistic was valid and the results were not biased. Therefore, the Greenhouse-Geisser values were utilized to determine whether the F statistic was significant for all analyses to address research questions 1 and 2.

Research Question 1

The first research question sought to identify trends in academic success measures by equity groups within the IPEDS 2017-2021 data. A series of repeated measures ANOVAs were performed to address this research question. An evaluation of the sphericity assumption using Mauchly's test revealed significant deviations from this assumption for all variables. Due to violating the sphericity assumption, the Greenhouse-Geisser correction was utilized to ensure that the F statistic was valid and the results were not biased. This correction adjusts the degrees of freedom for the F-tests in the ANOVA, providing more accurate results when the assumption of sphericity is not met (S. E. Maxwell, Delaney & Kelley, 2017). The results from these analyses for different measures of academic success are provided in Table 6.

The repeated measures ANOVA results for academic success, as outlined in Table 5, provide a detailed insight into the variations in academic success measures across different demographic groups over time. For the grand total score, a significant effect was found for the overall academic success measures ($F(1.413, 8022.524) = 32.730$, $p < 0.001$, $f^2 = 0.006$). This indicates statistically significant changes in the academic success measures across the years studied. The effect size value suggested that these differences were very small. Moreover, the

changes in academic success measures were found to be statistically significant for the following variables ($p < .05$): grand total men, grand total women, American Indian or Alaska Native men, Asian total, Asian men, Asian women, Black or African American total, Black or African American women, Hispanic or Latino total, Hispanic or Latino men, Hispanic or Latino women, Native Hawaiian or Other Pacific Islander men, White men, White women, two or more races total, two or more races men, two or more races women, race/ethnicity unknown women, nonresident alien total, nonresident alien men, and nonresident alien women.

The sizes of the differences for the following variables were found to be moderate based on the effect size: grand total women, Asian total, Asian women, Hispanic or Latino total, Hispanic or Latino women, two or more races total, two or more races men, and two or more races women. However, for the other variables with statistically significant differences in academic success over time, the differences were found to be small or very small (close or less than .01).

Table 5

Tests of Within Subject Effects for Number of Students Receiving Awards/Degrees by Race/Ethnicity and Gender

Variable	*df1*	*df2*	*F*	*Sig. (p)*	f^2
Grand total	1.413	8022.524	32.730	<0.001**	0.006
Grand total men	1.756	9970.087	5.709	0.005**	0.001
Grand total women	1.366	7758.767	58.642	<0.001**	0.010
American Indian or Alaska Native total	2.606	14795.986	1.545	0.206	0.000
American Indian or Alaska Native men	3.107	17638.781	6.273	<0.001**	0.001
American Indian or Alaska Native women	2.373	13474.711	2.055	0.119	0.000
Asian total	1.789	10155.602	99.806	<0.001**	0.017
Asian men	2.085	11836.164	54.381	<0.001**	0.009
Asian women	1.869	10614.364	118.470	<0.001**	0.020
Black or African American total	1.887	10712.937	25.588	<0.001**	0.004
Black or African American men	1.860	10563.081	2.727	0.070	0.000

Variable	df1	df2	F	Sig. (p)	f^2
Black or African American women	1.944	11036.145	37.131	<0.001**	0.006
Hispanic or Latino total	1.429	8114.615	102.203	<0.001**	0.018
Hispanic or Latino men	1.779	10101.816	53.064	<0.001**	0.009
Hispanic or Latino women	1.370	7780.191	130.315	<0.001**	0.022
Native Hawaiian or Other Pacific Islander total	3.056	17350.114	0.860	0.463	0.000
Native Hawaiian or Other Pacific Islander men	3.246	18430.914	2.580	0.047*	0.000
Native Hawaiian or Other Pacific Islander women	3.441	19536.291	1.535	0.197	0.000
White total	1.313	7456.548	0.930	0.360	0.000
White men	1.661	9428.655	12.131	<0.001**	0.002
White women	1.274	7233.137	4.387	0.027*	0.001
Two or more races total	1.913	10864.648	203.613	<0.001**	0.035
Two or more races men	2.409	13678.852	124.006	<0.001**	0.021
Two or more races women	2.055	11668.736	204.629	<0.001**	0.035
Race/ethnicity unknown total	1.647	9350.404	2.473	0.095	0.000
Race/ethnicity unknown men	1.707	9692.183	0.846	0.413	0.000
Race/ethnicity unknown women	1.746	9915.332	4.700	0.012*	0.001
Nonresident alien total	1.716	9744.058	4.580	0.014*	0.001
Nonresident alien men	1.634	9278.783	3.675	0.034*	0.001
Nonresident alien women	2.082	11822.578	10.318	<0.001**	0.002

Note. * Significant at the $p < .05$ level. ** Significant at the $p < .01$ level.

On the other hand, for the following variables, no statistically significant differences were observed over the period 2017-2021: Black or African American men, and race/ethnicity unknown total, American Indian or Alaska Native women, Native Hawaiian or other Pacific Islander women, American Indian or Alaska Native total, White total, Race/ethnicity unknown men, Native Hawaiian or Other Pacific Islander total. As observed, the significance values were above .05, indicating that there is insufficient evidence to reject the null hypothesis, which stated that there is no difference in the academic success of racial and gender groups over the period of five years. The results of the analyses determined that the academic success of these racial and gender groups did not vary over time. Thus, the academic successes of these racial and gender groups were consistent over the period of 5 years.

The tests of within-subject effects for the number of students receiving awards/degrees by race, ethnicity, and gender showed significant differences among various

demographics. Specifically, in the case of gender grand total, women component Asian total, men and two or more races nonresident alien women F-values were all statistically significant ($p < .05$), which indicates that these variables had a significant effect on the dependent variable. Significantly, the values of f^2 for these variables ranged from .001 to 35, which is actually what makes it a small effect size on all contrary sides: American Indian or Alaska Native total, American Indian or Alaska Native men, and Blacks/African Americans women were non -significant ($p > .05$). In addition, for Native Hawaiian or Other Pacific Islander total, Race/ethnicity unknown women and Nonresident alien total the F-values were statistically significant, but effect sizes were small ($f^2 < .01$) showing almost no practical significance. These findings support the conclusive direction that race/ethnicity and gender should be considered when assessing academic indicators of performance among postsecondary students.

Research Question 2

The second research question examined the relationships between demographic variables and teaching modalities. A series of repeated measures ANOVAs were performed to address this research question. An evaluation of the sphericity assumption using Mauchly's test revealed significant deviations from this assumption for all variables. Due to violating the sphericity assumption, the Greenhouse-Geisser correction was utilized to ensure that the F statistic was valid and the results were not biased. This correction adjusts the degrees of freedom for the F-tests in the ANOVA, providing more accurate results when the assumption of sphericity is not met (S. E. Maxwell, Delaney & Kelley, 2017). The results from these analyses for the number of programs offered and the number of programs offered via distance education for different levels of demographic variables are provided in Table 6.

A significant effect was observed for the overall number of programs offered ($F(1.844$, $10,583.523) = 189.680$, $p < 0.001$, $f^2 = 0.032$). This indicates statistically significant changes in the number of programs offered across the years studied. The effect size value suggested that the size of the differences over the years 2017 to 2021 was moderate. Moreover, the number of programs offered via distance education also showed a significant difference ($F(2.781$, $15,959.150) = 44.069$, $p < 0.001$, $f^2 = 0.008$). However, the effect size was very small, indicating a relatively minor difference from 2017 to 2021.

Additionally, statistically significant differences ($p < .05$) were identified for the following variables: number of associate's degree programs offered, number of associate's degree programs offered via distance education, number of bachelor's degree programs offered, number of bachelor's degree programs offered via distance education, number of master's degree programs offered, number of master's degree programs offered via distance education, number of doctor's degree-research/scholarship programs offered, number of doctor's degree-professional practice programs offered, number of 1-year, but less than-2-year certificate programs offered, number of postbaccalaureate certificate programs offered, number of postbaccalaureate certificate programs offered via distance education, number of postmasters certificate programs offered, and the number of 1-year but less than 2-year certificate programs offered via distance education.

Table 6

Results of Tests of Within Subject Effects for the Number of Programs Offered and the Number of Programs Offered via Distance Education

Variable	df1	df2	MS	F	Sig. (p)
Number of programs offered	1.844	10583.523	1079.484	189.680	<0.001**
Number of programs offered via distance education	2.781	15959.150	300.773	44.069	<0.001**
Number of associate's degree programs offered	1.749	10035.137	75.071	45.924	<0.001**

Variable	*df1*	*df2*	*MS*	*F*	*Sig. (p)*
Number of Associate's degree programs offered via distance education	2.743	15743.202	27.331	17.112	<0.001**
Number of bachelor's degree programs offered	1.654	9492.311	236.976	81.670	<0.001**
Number of bachelor's degree programs offered via distance education	2.803	16083.894	33.169	57.869	<0.001**
Number of master's degree programs offered	2.036	11683.074	47.017	136.392	<0.001**
Number of master's degree programs offered via distance education	2.715	15581.909	34.474	44.106	<0.001**
Number of doctor's degree-research/scholarship programs offered	1.586	9100.550	16.844	31.174	<0.001**
Number of doctor's degree-research/scholarship programs offered via distance education	1.769	10153.798	5.534	1.853	0.162
Number of doctor's degree-professional practice programs offered	2.203	12643.461	0.858	70.579	<0.001**
Number of doctor's degree-professional practice programs offered via distance education	2.574	14774.243	0.359	2.290	0.086
Number of doctor's degree-other programs offered	2.179	12503.960	0.129	2.645	0.066
Number of doctor's degree-other programs offered via distance education	3.172	18206.013	0.047	2.050	0.101
Number of 1-year, but less than-2-year certificate programs offered	2.017	11577.008	38.834	25.353	<0.001**
Number of 1-year, but less than 2-year certificate programs offered via distance education	2.956	16966.334	4.493	5.425	0.001**
Number of 2-year, but less than 4-year certificate programs offered	1.992	11432.242	3.853	1.846	0.158
Number of 2-year, but less than 4-year certificate programs offered via distance education	2.831	16248.063	0.112	0.704	0.541
Number of postbaccalaureate certificate programs offered	1.526	8759.323	72.413	125.792	<0.001**
Number of postbaccalaureate certificate programs offered via distance education	1.835	10528.735	20.157	19.473	<0.001**
Number of postmaster's certificate programs offered	1.407	8075.903	31.874	10.502	<0.001**
Number of postmaster's certificate programs offered via distance education	2.766	15876.606	3.322	1.799	0.150

Note. * Significant at the *p* < .05 level. ** Significant at the *p* < .01 level.

For the variables of the number of bachelor's degree programs offered, number of bachelor's degree programs offered via distance education, number of master's degree programs offered, number of doctor's degree-professional practice programs offered, and number of postbaccalaureate certificate programs offered, the size of the differences was moderate, while for the other variables were small or very small.

On the other hand, no statistically significant differences were identified for the following variables: number of doctor's degree-other programs offered, number of doctor's degree-

professional practice programs offered via distance education, number of doctor's degree-other programs offered via distance education, number of post-masters certificate programs offered via distance education, number of 2-year, but less than 4-year certificate programs offered, number of doctor's degree-research/scholarship programs offered via distance education, and number of 2-year, but less than 4-year certificate programs offered via distance education.

Significant results were revealed regarding other variables relating to the number of programs offered and mode of delivery. The analysis found substantial variations in means for the number of programs offered and the mean number of distance education programs provided under different categories.

For instance, the number of associate's degree programs offered ($F = 45.924$, $p < .001$) and the bachelor's level provided accounted for meaningful differences in academic performance measures as well ($F = 57.869$, $p < .001$). Considerable effects were observed for the number of master's degree programs provided ($F = 136.392$, $p < .001$) and postbaccalaureate certificate programs offered ($F = 125.792$, $p < .001$). This was also found to be significant in colleges where it happened. Moreover, significant differences were obtained in the number of distance-offered programs, including Associate's degrees ($F = 17.112$, $p < .001$), bachelor's degree (bachelor) programs ($F = 3\ 3.169$, $p < .001$), master ($F = 34.474$, $p < .001$), and postbaccalaureate ($F = 19.473$, $p < .001$).

These findings have implications for analyzing academic achievement outcomes related to program delivery mode. Other follow-up ANOVAs revealed substantial effects for some types of certificate programs, including longer than 1 year but less than a 2-year certificate program offered by distance ($F = 5.425$, $p = 0.001$) and the postmaster's certification major group reported ($F = 10.502$, $p < .001$) these findings point to potential target areas requiring.

Summary

      This Secondary Analysis study aimed to examine factors influencing inequities in academic success measures among equity groups within the U.S. postsecondary education system, focusing on the role of teaching modality. Demographic variables (gender and race), program types, and teaching modalities were each considered. The investigation centered around two key research questions: identifying trends in academic success measures by equity groups and examining statistically significant relationships between demographic factors and teaching modalities.

      As a college instructor, I have experience regarding the influence of online and hybrid learning modes on student success. I acknowledge the potential influence of my position and experiences on the outcomes of this research. I have made efforts to mitigate this potential bias in my research study on the influence of online and hybrid learning modes on student success in higher education. I acknowledge my rich knowledge of the educational environment but strive for objectivity by adopting a balanced approach, keeping reflexive journals, and engaging in peer debriefing. I employ rigorous methodologies, including robust quantitative analyses of secondary data from the IPEDS database, to ensure reliable findings. I emphasize my commitment to contributing objectively to the understanding of the topic, ensuring that study outcomes are grounded in empirical evidence rather than personal experiences.

      Assumptions of repeated measures ANOVA were tested prior to conducting the analyses to ensure that the data do not violate any of the assumptions that may affect the results of the analyses. There were five assumptions checked for the analyses. After testing all assumptions, the repeated measures ANOVA was conducted.

The first research question investigated trends in academic success measures by equity groups using repeated measures ANOVA. Significant variations were found in academic success measures across different demographic groups over time. For the grand total score, there was a statistically significant change in academic success measures across the studied years, although the effect size was small.

Significant changes were also observed for various demographic groups, including women, men, and different racial/ethnic groups, with some showing moderate effect sizes. However, no significant differences were observed for certain groups, such as Black or African American men, and some unknown race/ethnicity categories. These findings indicate that while improvements in participation in various programs and completion have been realized among many groups, the magnitude and consistency of these changes vary considerably across different demographic groups.

The second research question focused on the relationships between demographic variables and teaching modalities. The analysis revealed statistically significant changes in the number of programs offered and the number of programs offered via distance education across the years. The effect sizes for these changes ranged from small to moderate, indicating varying levels of impact over time.

Significant differences were identified for specific types of programs, such as associate's, bachelor's, master's, and doctoral degrees, both in general and specifically via distance education. The differences indicate that every program has different characteristics and requirements, especially for distance learning. In addition, there have been significant changes in program offerings, especially with the rise of distance education; the impact of these changes is unique across all types of academic programs.

The implications of these findings are explored in-depth in Chapter 5, which situates these results with existing literature. Study conclusions are presented along with recommendations for both practice and scholarship.

Chapter Five: Conclusions, Implications, & Recommendations

This research covered academic achievement considering the factors that lead to success among different social categories using monitoring the results of the Integrated Postsecondary Education Data System (IPEDS) from 2017 to 2021. Utilizing a quantitative research design, the study focused on two key questions: variations of academic performance by equity groups and the link between demographic traits and teaching modes. The research was rooted in the groundbreaking work of Astin's "student involvement theory" and Rawls' "theory of justice," and because of that, it sought to discover paths to educational equity as well as reinforcement of democratic societies. The study had multiple objectives: to reveal patterns of academic achievement, to examine the statistical associations between demographic factors and teaching modalities, and to provide guidelines with important implications for the educational policy and process. By researching face-to-face, online, and hybrid teaching modes through empirical exploration, the relationship of these teaching modalities with demographic variables such as gender and race was determined. These principal factors have been well-known as elements affecting student academic performance.

In this study, the data source was studied in-depth, and the methodological precision was strictly followed. Therefore, the research results have shown a detailed picture of the academic environment. They enumerated the necessity of a better understanding of how educational approaches can become adaptive mechanisms over time to handle the chasm in instruction and learning, as well as to acknowledge the multiple facets of the student's identity that influence education. Remaining cognizant of the value of preserving educational equity, the chapter begins with the objective of bringing the findings into the existing literature, imbuing the results into the broader context of education research. It is a chance to go back to the study objectives, to review

the challenges that have been and still are, and to set up the basis for the strategies that approach the principles of university inclusion and success.

Purpose and Methods of the Study

The purpose of this quantitative Secondary Analysis was to identify factors associated with inequities in success measure scores by equity group within the United States postsecondary education system. This study was based on IPEDS data from the years 2017-2021 to find out if there are any patterns in academic prosperity among students from various backgrounds. The IPEDS dataset, run by the NCES, contained data and trends on the postsecondary education landscape, such as enrollment numbers, rates, and degrees granted. Through investigation of the variables of instructional modalities used—online, face-to-face, and hybrid—this study sought to establish how the modalities interact with different factors such as age, gender, race, and socioeconomic status to affect academic outcomes.

Multi-level secondary analysis was carried out on IPEDS data focusing on demographic variables (gender & race), program types (associates, bachelor's, and certificates), and modality (online, in-person, and blended learning/hybrid). The quantitative methodology was selected among the others because it is especially suitable for exploring large representative datasets to draw differences and correlations between populations. This approach enabled a nucleation of the influence of instructional modalities on the academic performance of the three equity groups as informed by the epistemological belief that objectivity can be measured and interpreted independently by a researcher.

Theoretical Foundation Summary

This study was anchored in three fundamental theories pertinent to educational equity: Freire's pedagogy of the oppressed, Rawls' theory of justice, and Astin's theory of student

involvement. Each of them proposes a unique point of view on overcoming educational inequalities. The work of "Pedagogy of the Oppressed" by Freire (2000) proposed education as a means toward the liberation of the oppressed, insisting on a dialogic, problem-posing model that promotes critical thinking and empowerment (Peters & Besley, 2015; Ramalho, 2022). This theory plays a key role in this study because it explicitly creates education's role in helping the oppressed challenge and transform the structures of oppression and calls for an educational system that ensures equality and the empowerment of all students.

Justice theory by J. Rawls (1971) discussed distributive justice via the social contract approach by giving equal rights and liberties (Mabe, 1973; Said & Nurhayati, 2021). This approach was in line with the study objective and the research aim, which was to analyze how the online and lecture-integrated types of learning can promote educational equity so that all students get teaching approaches that benefit them equally, especially the disadvantaged students. The student involvement theory by Astin (1984), therefore, emphasizes the need for students to be actively involved in the learning process. Lastly, the IEO (Inputs, Environment, Outcomes) model serves as a theoretical framework used to explore the impact of various teaching modalities on different student groups' engagement and achievement, with particular emphasis on diverse demographic groups (Cheng, 2022; Ramos, 2022). These theories suggest a holistic theoretical framework for the study, with a special focus on the educational equity dynamics and students' attainment of academic success in the light of different types of teaching modalities.

Key Findings

This study presented significant trends in academic success indicators for equity groups from 2017 to 2021. The series of ANOVA tests showed that academic success measures had

significant changes from one year to the next, and therefore, there were differences in academic attainments across different demographic groups. The finding indicates that the mean number of bi or multiracial individuals with awards/degrees was consistently increasing, with a bias towards women. Likewise, the number of degrees conferred on Hispanic or Latino students and Black or African Americans also grew fast, as their female students acquired the highest number of degrees than their male counterparts.

Moreover, the research established statistically significant associations between demographic factors and teaching modalities that were characterized by changes in the number of programs and the number of programs run via distance education across the years. The expansion of Associate's degree offerings and the gradual rise in Master's degree programs that have been provided throughout the years showed the growing diversity of the academic environment. Nevertheless, this study also showed a decline in distance bachelor's programs offered in 2020 and 2021, suggesting the volatility of distance education programs amidst the growing demand for shorter educational programs.

Interpretation of Findings

This study lends significant perspectives that shape the factors that influence academic performance, which have been analyzed in depth through the interaction between demographic characteristics and teaching methods. This study extends prior scholarship, like that of Paulsen and McCormick (2020), which has drawn attention to the deep impact of demographic factors— such as gender, age, socioeconomic status, being a first-generation student, and race—on academic success. The results from these studies lay the foundation for the interpretation of the intricate trends in the data that we present here on equity in higher education outcomes. The results, supported by data from IPEDS covering the years 2017 to 2021, can shed light on

essential aspects of the link between academic performance and the variables that influence it. The basis of this extensive analysis is built on the previous influential research, as Paulsen and McCormick (2020) and Altindag et al. (2021) focused on the significant effect that demographic variables play on educational outcomes. Academic success is a complex concept that includes not only measurable criteria such as grades and tests but also covers broader areas, including personal growth and social impact. The broader view tries to paint the picture of the intricate relationships between factors such as demographics, pedagogies, and learning and link them into a larger educational debate.

Demographic Influences on Academic Achievement

The findings of this study align with the conclusions of Baldock et al. (2021), who stressed the importance of teaching strategies and alignment with pedagogical practices in promoting student success. Gender and race-based disparities underscore the significant effects of demographic factors on education, corroborating studies like those by Paul and Jefferson (2019), which found significant differences in outcomes based on these demographics. These discoveries advocate for an educational setting that employs evidence-backed teaching methods attuned to the varying needs of students, aiming not just to improve educational equity but also to prepare learners for broader roles in society.

Modalities of Instruction and Student Engagement

Online and hybrid models' migration in the case of teaching methods drew attention to both the advantages and the disadvantages of these modalities. O'Keefe et al. (2020) also emphasized that the digital education landscape cannot succeed without creative dialogue and idea exchange. But, the increasing use of online education is also, to some extent, due to the desire to provide access to education to the rest of the world, as Audu et al. (2017) and Sellami et

al. (2017) stressed. The new paradigm calls for the use of inclusive teaching approaches that would help prevent online learning environments from disengagement and loneliness.

The Digital or Access to Education

The authors of Norman et al. (2022) attested that the digital divide is one of the biggest issues in the education sector that hampers equality as this leads to unequal access to technology, which results in students from different socioeconomic backgrounds experiencing differences in their abilities. The issue is exacerbated by the fast-growing trend of e-learning and blended learning methods. The study underscores the role of timeous policy interventions that are responsive to these inequalities because the authors are requesting that the intervention be inclusive to serve the purpose of ensuring equitable application of digital tools. This study supports this and shines a light on the inequity that exists among various demographics based on race and gender in receiving the benefits of online and hybrid modalities.

Policies and Blended Learning Approaches

There is an option for mixed learning modalities, which Paul and Jefferson (2019) recommended, with the assertion that it is located between traditional and digital teaching methods. The solution provides flexibility for the learners and incorporates the best part of both worlds. The congruence of the demographic patterns and the method of teaching positions blended classes among strategic educational directions to be pursued by those who work in the education and policy fields to achieve an equilibrium of accessibility, active participation, and academic excellence. The findings from this study can be applied as an all-rounded educational program. Therefore, strategies that work in synergy with variables such as technology and cultural diversity were offered. Through a provision of academic support and factors related to the investigated variable, a move was made to develop a just and fair educational system that is

capable of producing students who can give their best regardless of their demography or modeling.

Conclusions from the study

Four conclusions were derived from this study after analyzing the findings and emerging themes:

1. Online and hybrid instruction enhances student engagement satisfaction and overall success.

2. Race and ethnic-based disparities and inequities persisted as online and hybrid modalities were introduced.

3. Online and hybrid modalities did improve academic success by varying degrees within each gender category, with gender disparity continuing.

4. Both student demographics and the instruction modalities significantly influence the successes and/or obstacles encountered by individuals in their academic endeavors.

The conclusions and comparisons with previous literature are discussed in the next section.

Conclusion 1: Online and Hybrid Instruction Enhances Student Engagement Satisfaction and Overall Success

Results of the study indicate that online and hybrid classes enhance student engagement. The results align with previous research by Mukhtar et al. (2020), who indicated that online learning can offer various interactive tools and platforms, such as discussion forums, multimedia presentations, and virtual simulations, that may not be available in class. These resources often provide opportunities for students to engage actively with course materials, collaborate with peers, and receive immediate feedback from instructors. The data from the study support Greenhow et al. (2022), who suggested that the flexibility of online learning allows students to

study at their own pace, which can increase their motivation and participation compared to traditional classroom settings.

An analysis of data obtained from the study indicated that more students graduated after online and hybrid learning was introduced. This conclusion supports previous research by Henriksen et al. (2020), who suggested that many students find online and hybrid courses more convenient and flexible than traditional face-to-face classes due to their ability to access course materials and participate in discussions from anywhere with an internet connection, eliminating the need to commute to campus. Moreover, online platforms often offer diverse learning resources, catering to different learning styles and preferences. The study results are consistent with those of Bouilheres et al. (2020), who indicated that increased active engagement of students during the online and hybrid learning process may lead to higher achievement levels. The conclusion that online and blended learning enhances student success contradicts previous literature by Espayos et al. (2022), that isolation and loneliness associated with mental health challenges reduce the overall success of students. It is, therefore, important to consider the psychological impact of online learning on improving the mental health of students.

Conclusion 2: Race and Ethnic-Based Disparities and Inequities Persisted as Online and Hybrid Modalities Were Introduced

As online and hybrid modalities were introduced, disparities and inequities based on race and ethnicity continued to exist. This indicates that despite the shift to online and hybrid learning formats, racial and ethnic minorities still face unequal access to educational resources, opportunities, and support systems. Jones et al. (2020) and Thomson (2018) posited that students of African American descent often attend schools lacking sufficient resources. Additionally, while some students may have reliable internet access, personal computers, or other necessary

devices, others from marginalized racial or ethnic groups may lack these resources. Data from this study indicate that this digital divide exacerbates existing inequalities, limiting the ability of racial minority students to benefit from online or hybrid instruction fully.

Findings from this study indicated that although there has been an increase in academic achievement among various groups, the extent and uniformity of these achievements differ significantly among various demographic categories. These findings support Z. Li and Qiu (2018), who suggested that a high socioeconomic status enables parents to secure better educational opportunities for their children, thereby enhancing academic performance. The findings are also consistent with previous literature by Paschall et al. (2018) that students from low-income backgrounds, who are disproportionately represented in racial and ethnic minority groups, may be academically disadvantaged. Parents from poor backgrounds may face financial barriers to purchasing technology or accessing high-speed internet, leading to academic disparities in online and hybrid modalities.

Conclusion 3: Online and Hybrid Modalities Did Improve Academic Success by Varying Degrees Within Each Gender Category, With Gender Disparity Continuing

While both male and female students benefited from online and hybrid learning formats, there were still differences in academic achievement between genders. Data from the study indicated that the number of women who graduated was consistently higher than men across various demographics. The findings are consistent with Delaney and Devereux (2021), who confirmed the presence of gender disparities in academic performance, noting that females tend to achieve higher levels of education compared to males. Figlio et al. (2020) highlighted the presence of academic achievement disparities between females from households with low socioeconomic status and families with absent fathers who are performing better. Findings from

the study indicated that gender disparities continued to exist even after the introduction of online and hybrid modalities. Therefore, these gender disparities need to be addressed to promote equity and inclusion in online and hybrid education. This could be achieved through a thorough examination of gender-relations and having an open and honest dialog with students as well as educators and administration to find practical solutions to bridge the gaps when necessary.

Conclusion 4: Both Student Demographics and Instruction Modalities Significantly Influence the Successes and/or Obstacles Encountered by Individuals in Their Academic Endeavors

The study revealed that student demographics play a significant role in shaping the academic experiences of individuals. These findings support research by Ancheta (2022) that factors such as socioeconomic status, race, ethnicity, and gender of students can influence access to educational opportunities. Students from low socioeconomic backgrounds may face challenges related to technology access, while racial and ethnic minority students may encounter systemic barriers and inequalities within educational systems. Ebner and Gegenfurtner (2019) suggested that online learning enhances the affordability and accessibility of learning materials and resources through open access. This is in line with findings from this study that more students from financially disadvantaged racial minorities graduated after the introduction of online and hybrid learning.

The findings of this study revealed that instructional modalities significantly influenced the academic outcomes of students. This is in line with previous research by Bryan and Volchenkova (2016), who highlighted that online learning eliminates expenses associated with transportation and housing, which are challenges associated with traditional physical learning settings. However, the digital divide casts doubt on the notion of enhanced access, as certain students within classrooms or specific racial groups may lack the literacy skills or digital

resources necessary to fully utilize the advantages of increased accessibility (Buzzetto-Hollywood et al., 2018). This concurs with the results of this study, which indicate that demographics and instructional modalities influence the success or challenges encountered by students.

Implications and Recommendations

The study addressed the instructional modalities in detail and the way they are interrelated with both equity and academic success. The findings could have a significant impact on various areas like educational practice, policy formulation, and research. The theoretical foundations and literature that were used to frame this study, which include the literature review section on the scholarly contributions, justify these implications. An analysis of online and hybrid learning effectiveness gives rise to the most challenging themes for education reform at different strata. Pedagogical diversity, whereby learners have the opportunity to attain education through diverse teaching methods, can promote self-development, self-efficacy, and empowerment of an individual (Lau & Shea, 2022). In the process of students taking charge of their education, the benefits may radiate to the families and communities for influence and growth because of the participation of knowledgeable and educated persons in socio-economic and infrastructural development.

Implications for Practice

Equitable and flexible teaching modalities play an important role in the academic success of the students, which, in turn, leads to changes in their career paths by increasing their chances of employment and improving socioeconomic status. Education features vary greatly in individual prosperity, and research like that by Baldock et al. (2021) showed that teachers should put up strategies that are in line with students' development. Academic achievements lead to the

realization of individual potential, bring in self-confidence, and broaden opportunities and equality as well as capability.

Education accessibility changes could result in positive outcomes concerning the arrangement of the household. As opportunities for flexible learning become available, the people who were the victims of educational stagnation now advance academically and turn into positive catalysts of education that shape a conducive atmosphere of continuous learning at home. Family educational success acts as a catalyst for societal development, as evidenced by the enhanced learner intrinsic motivation and collaborative behaviors reported by O'Keefe et al. (2020). Within a family, academic success can bring inspiration and help the educational efforts of other family members, creating a positive cycle with knowledge growth and socioeconomic status improvement.

Conversely, educational establishments that value equity and inclusivity become the platform upon which these values are extended to other spheres of society. The adoption of online and blended learning models that make education more accessible by schools and universities becomes a center of innovation (Azouri & Karam, 2023). This change in academic settings can be a catalyst for a bigger change where it becomes necessary for different organizations not just to redesign the content but also the route of delivery and to make learning more personalized and inclusive. Recognizing the benefits that the combination of academic and professional circles brings to a workforce of people, the trends highlighted in this study are facilitative for learning focus, envisioning education as an instrument of innovation, and a source of a competitive edge. The impact of education equity goes far beyond academic institutions, influencing the workplace practices and social responsibility of corporations.

The trend toward online and hybrid education calls for the review of teaching pedagogies by instructors and professors. To teach with sensitivity to the wide range of learners, as noted by Paulsen and McCormick (2020), develops a personalized teaching style that is cognizant of variables including race, age, and socioeconomic status. The results of this study underpin the need to design a flexible learning environment in the form of various teaching strategies that are tailored to individual students' needs and can facilitate their academic progress and personality development. The expanding digital gap, which was pointed out by Norman et al. (2022), is a problem that teachers and educational institutions need to solve, and that can be solved through targeted initiatives that guarantee equitable access to educational content. The study's results hence recommend strategies that fill these technological divides so that all learners can not only be averse to but also be active players in current-day educational contexts.

On the policy level, the results give evidence about the need to form such support structures that ensure inclusion and equal chances to study at the university level. The study has suggested that policymakers base their decisions on the knowledge gained in this study about the link between success and demographics to derive policies that can eradicate structural barriers and create equal education opportunities for all students. Furthermore, the research suggests that educational institution administrators create policies that can capitalize on the innovative use of technology to facilitate education.

From a methodological point of view, this research supports the policy value of using statistics from reliable sources like NCES for performing calculations that can inform policies or practices in school. The inductive method exercises a major influence on the impact of data analysis that leads to findings that can be generalized. This study thus emphasizes the usefulness of secondary data in studying education through evidence of their successes in the approach.

Future studies can improve this by incorporating primary data types that gather rich, contextual data that is capable of deepening our comprehension. The mixed-methodology approach, which takes quantitative and qualitative data together, is likely to result in a full understanding of academic performance. It also improves the validity of findings through triangulation. Such qualitative data can be gathered and focused on the lived experiences of students as well as educators in order to provide a deeper understanding of their real experiences.

Recommendations for Practice

Several practice recommendations are derived from this study, which can help improve online and hybrid modalities and equity in post-secondary education. Strategies need to be implemented to enhance student engagement and satisfaction in online and hybrid instruction, such as interactive learning activities, multimedia resources, and virtual collaboration platforms. Additionally, initiatives should be developed to address race and ethnic-based disparities in online and hybrid learning environments, including culturally responsive teaching methods, diversity training for instructors, and equitable access to resources and support services. Online and hybrid instructional approaches should be tailored to accommodate the learning needs and preferences of each gender category while also addressing gender disparities through targeted interventions and support programs. Finally, educational programs and interventions should be designed to consider the demographics of students to promote inclusive and equitable academic experiences for all individuals.

Summary of Implications for Scholarship

One of the theoretical implications of this study is the link between students' demographic composition and success measures. The findings of this study are compatible with the major theories, including those of student engagement and educational justice, that are

underpinned by the quantitative data. This information can be utilized in strategies that promote inclusive learning and address the diverse needs of students (Paulsen & McCormick, 2020; Sellami et al., 2017). This research integrates these theories into the study of present-day educational institutions and thus explains why Freire's pedagogy of the oppressed, Rawls' theory of justice, and Astin's theory of student involvement remain important in evaluating the fusion of educational technologies and the fairness of learning outcomes.

This study empirically adds to the literature regarding academic performance determining factors. It broadens the perception of how the forms of teaching, which are aligned with demographic features, create the outcomes of education. The evidence provided informs educational practitioners and policy developers on strategies that they can utilize to reduce the existing educational disparities. Therefore, this line of inquiry suggests reconsideration and improvement of the design of different stakeholders in education. Only when the different factors that this study described as making an impact on education are taken into account by the stakeholders can education evolve into a dynamic mechanism that takes into account fairness in society, leading to the creation of an environment where students from all backgrounds can achieve not only academically but also socially.

This study offers a broad range of implications, thus spreading its influence beyond scholarly disputes. It offers a viewpoint envisioning and implementing the improvement of educational systems, encompassing not just academic metrics but the whole development of civilization. Through acting upon this evidence, educators and leaders can advance toward a future in which education will be rewarding to oneself and, at the same time, a key element of societal growth and justice. Taking as reference the quantitative framework of the present study, the researcher can further research the qualitative components of learning across different

modalities of teaching and those details of the quantitative analyses that can be overlooked. Research should expand to examine in more depth how students' and instructors' personal experiences impact education equity and success for student experiences and a variety of instructional contexts.

Further, the current study findings on the role of demographic variables in academic performance provide clues for a more detailed investigation of subgroups and populations that lack representation or face specific challenges in post-secondary education, in accord with the major contribution of Paulsen and McCormick (2020). In the last instance, the outcomes of this study act as an impetus for the improvement of existing and future endeavors to realize the academic sphere. Using the empirical findings of this study and accepting the multitude of factors it elucidates, stakeholders and researchers can work together to set up an inclusive academic platform. This setting can introduce modalities and demographics as instruments for producing academic success and societal advancement.

Recommendations for Scholarship

This study offers several recommendations for scholarship. Further research is needed to investigate the underlying factors contributing to race and ethnic-based disparities in online and hybrid learning environments, such as access to technology, cultural responsiveness, and systemic barriers. Additionally, future studies should investigate the relationship between gender and academic success in online and hybrid modalities, including the intersectionality of gender with other demographics, as well as looking specifically at each gender separately to understand variables influencing each groups' success that would contribute more to both scholarship as well as to practice. Studies should also be conducted to examine best practices for promoting inclusivity and addressing obstacles encountered by students in online and hybrid learning

environments. The digital divide—that is, the variation in internet access and related digital resources among learners—is yet another area researchers should further explore and study how it connects to the factors of socioeconomic status, as found by Hass et al. (2023).

Limitations of the Study

The comparative analysis of teaching methods has shown that online/hybrid approaches have both positive and negative features. O'Keefe et al. (2020) used dialogues and exchanging of ideas to emphasize that the current digital environment calls for better educational models. The main reason for the emergence of online education is the promotion of the broadening of the global access goal of education, as was advanced by Audu et al. (2017) and Sellami et al. (2017). The transformation of the paradigm demands teachers to apply inclusive teaching strategies that facilitate students' participation in the learning process by minimizing the likelihood of students experiencing disengagement and isolation that can occur in online environments. Therefore, the digital divide is one of the important types of education inequality, in line with Norman et al. (2022), who observed that inequality in accessing technology aggravates the existing inequalities between students from different socioeconomic backgrounds. It is even worsened by the growing trend in the use of blended and online learning. This study underlines the importance of tailor-made policy responses tackling these disparities since Hass et al. (2023) advocated inclusive measures and equal access to digital technology tools.

Age and gender, along with their effect on academic performance, have been studied herein. Moreover, the analyses cannot fully unwind the intricate causal relationships between demographic factors and their different outcomes on student performance. While this study has identified associations between factors such as race, gender, and instructional modality, some other unmeasured variables could likely play a part in this. In this case, it is possible that these

additional factors might be confounding this relationship. Likewise, the study has explored the influence of teaching modalities (online, hybrid, and face-to-face) on academic success indicators of equity. On the other hand, it may not deal with all the finer points of the situation, the issues that may include different levels of technology accessibility, varying degrees of individual motivation, and the nuances of the student experience that impact the outcome.

Internal Study Validity

Internal study validity is an important aspect of research methodology, which ensures that the findings accurately reflect the relationships between variables and can be replicated consistently (Patino & Ferreira, 2018). To ensure validity, variables, and concepts were defined precisely to ensure that they were measured accurately and consistently throughout the study. The IPEDS survey instrument, which was utilized in this experiment, yielded consistent results over time and across different conditions, which enhanced its validity. After the data was collected, it was locked to maintain integrity and accuracy, thereby enhancing the study's internal validity.

Although significant work was done to ensure the study's validity by dealing with the data thoroughly and opting for the relevant methodology, it should be taken into consideration that the limitations restrict the scope of the data's application. The findings of this study should be analyzed with caution since there are some constraints that have the potential to adversely affect the interpretation of the results. Also, cautious claims about the practical utility of this study should be made. They also point to the need for more research on the issues related to the factors that should be considered when analyzing these variables and the possible effect of these factors on educational fairness and student success.

Closing Comments

The study sought to investigate the influence of diverse factors on academics through an equity perspective and the utilization of different teaching methods using a quantitative approach that involved the analysis of data from the integrated postsecondary education data system covering the years 2017 to 2021. The study evaluated the elements that promote or prevent equal academic attainment and how online and hybrid learning relative to traditional face-to-face teaching methods affect academic outcomes. The results revealed that both demographic student characteristics and type of instruction play a role in determining and shaping the successes and challenges that individuals encounter in their academic journey. Further, the part played by demographic factors in academic performance, as demonstrated in this study, begets the need to consider scholars who come from certain specific groups, particularly those who are underrepresented or go through certain unique challenges in higher education settings. In the end, this research has the potential to be the force that propels ongoing and future projects into significant refinements in the domain of education.

Using the lessons of this study through the applied approach and considering all the biases the study uncovered, diverse players can achieve a robust scholarly ecosystem using collaboration. The tools to be used in the given setting are the modalities and demographics that will help reinforce the country's academic standards and socio-economic progress. This study sought to determine how academic success is influenced by different teaching modalities. The data were collected and analyzed through the quantitative method using the integrated postsecondary education data system data from 2017 to 2021. The study was focused on the exploration of contextual factors that support or hinder equity in learning and teaching and the extent, if any, to which online and blended learning are better than traditional face-to-face

classes. The findings indicated that the form of the student population and the mode of instruction are the determinants of students' experiences, which are successes and challenges in their academic engagement.

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