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Assessment of Learning Outcomes Based on Teaching Modality and Gender: Do Online Students have Equivalent Academic Performance as Campus-Based Learners?

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ABSTRACT: *Accreditation bodies require that learning goals and outcomes of higher education courses and programs remain the same for traditional campus-based face-to-face, online, and hybrid teaching modalities. This study aims to assess and compare learning gained in an undergraduate course entitled "Managing Workforce Diversity" and to measure performance among students completing the course online compared to those attending in a traditional campus-based format. The study used a quantitative analysis of final exam scores from 414 students. Student performance was defined as the score on the final exam and the overall accumulated total course grade. Both online and traditional face-to-face students received the same learning outcomes, assignments, lectures, and exams. The results showed a statistically significant difference in the accumulated total course scores of students, with online students performing better. Female students had a significantly higher overall total course score compared to their male counterparts. Overall, both male and female groups had higher performance online. Implications for disparate impact based on gender and recommendations are provided*.

Key words*: Assessment of learning, performance equivalency, teaching modality, online education, four-fifths rule, disparate impact analysis, adverse impact, gender disparity.*

1. Introduction

The assessment of learning outcomes and performance is a crucial aspect of education, as it enables educators to evaluate the effectiveness of their teaching methods and determine whether students have achieved the desired learning objectives. In the context of online versus traditional face-to-face modalities, the assessment of learning outcomes takes on even greater significance to ensure learning equivalency (Gikandi et al., 2011). This is because online learning environments present unique challenges and opportunities that can impact student learning outcomes in distinct ways (Kanaris and Mujtaba, 2024; Mujtaba & Mujtaba, 2004). For instance, online learning environments often require students to work independently and manage their own time, which can affect their motivation and engagement (Dumford & Miller, 2018; Broadbent & Poon, 2015).

Despite the teaching platform differences, the assessment of learning outcomes online and in traditional face-to-face modalities shares the common goal of ensuring that students have acquired the knowledge, skills, and competencies necessary to succeed in their chosen field (Broadbent & Poon, 2015). However, the assessment methods and tools used online and in traditional face-to-face modalities may differ. For example, online learning environments may utilize technology-enhanced assessment tools, such as online quizzes and discussion forums, to evaluate student learning outcomes. In contrast, traditional face-to-face modalities rely more heavily on in-class exams, oral discussions, case studies, and paper-based assignments (Mujtaba, 2025a). By examining the assessment of learning outcomes in both online and traditional campus-based

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modalities, educators can gain a deeper understanding of how to optimize student learning and improve educational outcomes by integrating more engaging exercises and assignments (Mujtaba and Preziosi, 2006).

Changes in how education is delivered to students through the emerging array of modalities have intensified the questions of institutional effectiveness (Moorehouse, 2001). For the past three decades, much attention has been directed at the number of online education offerings and delivery mechanisms among institutions, and to questions of equivalency between such offerings and courses delivered through traditional, face-to-face means. Questions of equivalency have ranged from the resources provided to students in all modalities and the outcomes of student learning. As educational modalities increase in importance, continuous and documented evaluation will continue to be a critical component of process improvement. A major element of delivering superior value for educational institutions is to assess the achievement of learning outcomes among their students and to use such results for continuous improvement (Mujtaba, 2025a). Institutional accountability has become the focal point for each program offered by a university. Assessment of higher education has been embraced at the state governmental level as well as various educational foundations and organizations nationally and internationally that are expressing concern and lobbying for responsiveness and continuous improvement (Mujtaba and McAtavey, 2006).

With the widespread availability of the internet, the concept of "distance education" is primarily associated with online delivery systems of education which often require synchronous and asynchronous collaborations and lectures (Mujtaba & Preziosi, 2006). The comparative efficacy of programs offered online and in remote locations has been questioned since universities first began offering courses through diverse modalities, in addition to their main campuses. Consequently, students, parents, and governments who sponsor higher education have wanted verification that the expenditures are a sensible investment (Barnes et al., 2008; Preziosi et al., 1999). Concerns about the effectiveness of online, off-site, and hybrid programs have been met by calls for increased measurement of student learning outcomes (Kretovics & McCambridge, 2002).

The various forms of education have long been an accepted and expected alternative delivery system that has proliferated throughout the United States of America (Cook, 2000). Nonetheless, the question remains in many educators' minds: Is the level of learning equivalent in online and traditional campus-based programs? This study presents a comparative analysis of face-to-face campus-based versus online performance of learning outcomes at Nova Southeastern University's College of Business and Entrepreneurship in the undergraduate program. The aim of the research is to evaluate the learning achievement of students completing an undergraduate course on the main campus versus those in the online modality. Additionally, this study investigates the performance achievement of undergraduate students based on gender using online and traditional modalities. The paper provides a literature review, followed by the methodology and analysis, and ends with a discussion of the findings.

2. Literature Review

Accurately assessing the learning outcomes of a particular classroom of students has always been required of educators and administrators by higher education ministries and/or accreditation bodies (Mujtaba, 2025b). With the increase of non-traditional educational modalities, such as off-campus, hybrid, and online classes, pressure has mounted for academic institutions to document learning outcomes (Kretovics & McCambridge, 2002). A major shortcoming of the many institutions that have some sort of outcomes evaluation program in place is that their curricular assessment efforts do not take a panoramic approach to planning (Slegna & Bantham, 2002).

Assessment of learning outcomes is crucial in both online and traditional campus-based courses, but the methods and significance differ due to the nature of each learning environment. In traditional classrooms, instructors can directly observe student engagement, body language, and participation, allowing for real-time feedback and adjustment of teaching strategies (Dumford & Miller, 2018). Assessments such as in-class exams, presentations, and group discussions provide tangible ways to measure student understanding. Since students in face-to-face settings benefit from structured schedules and direct interaction, assessments often focus on individual performance within a controlled academic environment through various forms of proctoring (Gikandi et al., 2011).

Online teaching modalities became required during the initial months of the Covid-19 pandemic in 2020 when schools were closed for several months due to social distancing protocols mandated by government

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(Korman and Mujtaba, 2020). Consequently, many students completed their studies from their rooms; as such. assessment played an even more critical role due to the lack of physical presence and real-time monitoring. Online learning relies heavily on self-discipline, digital communication, and asynchronous engagement, making it essential to design assessments that accurately measure learning without direct instructor supervision (Broadbent & Poon, 2015). Methods like discussion boards, project-based assignments, and proctored or recorded exams help ensure academic integrity and student comprehension for both short- and long-term application. Additionally, learning analytics can track student progress, engagement, and time spent on coursework, offering valuable insights into their learning behaviors (Siemens & Long, 2011).

Comparing both settings, online assessments require more emphasis on authenticity, flexibility, and technology integration, while traditional assessments rely on structured environments and direct observation. The importance of assessment in both modalities is to ensure that learning objectives are met, but online courses necessitate innovative evaluation techniques to account for different learning and interaction styles (Gaytan & McEwen, 2007). Regardless of the format, well-designed assessments guide students in their academic growth and provide educators with data to refine their teaching approaches, while satisfying the needs of parents, administrators, and government policy makers to ensure revenues spent on education is making a positive difference.

According to Eastmond (1998), the term distance education became synonymous with instruction and facilitation provided through cyberspace technologies via the Internet. As such, many such programs are commonly referred to as online education. Integrating a systematic testing and evaluation plan into the curriculum for student learning and learning assessment is a necessity in today's competitive world of education. As such, administrators should focus on the development, assessment, and implementation of comprehensive testing and evaluation strategies in their curriculums (online, on-ground, and blended formats of distance as well as traditional offerings) while focusing on effectively achieving learning outcomes equally well in all modalities.

A traditional panoramic view of outcomes assessment has included the extent to which graduates secure a job, find lucrative positions at respected companies, go on to reputable graduate or professional programs, and garner an acceptable salary (Preziosi et al., 1999). If graduate placement rates are high, then it is assumed that the program has been successful, especially if the companies hiring are well known. While this continues to be an acceptable approach for many traditional programs, there is a growing need for other outcome measures. This is especially important in programs with alternative delivery systems whose students are normally already gainfully employed (Barnes et al., 2008).

Literature provides consistent indications of the relative effectiveness of different teaching modalities. In one study, a comparison of outcome measures revealed no difference in the overall course means between campus-based and off-campus deliveries (Spooner et al., 1999). Others have confirmed the high quality of learning that could occur via online, and off-site education programs (Kretovics and McCambridge, 2002). The quality of off-campus instruction is not only comparable to what is provided on campus but can sometimes be even better by providing a level of creativity and energy that surpasses ongoing traditional campus-based programs (McFall & Freddolino, 2000). The outcomes for a single course taught in different modalities have been shown to be very similar when comparing campus-based and off-campus outcomes (Mujtaba & Preziosi, 2006). Regardless of the learning outcomes development process, research suggests there is a compelling need for school administrators and faculty to compare campus-based and off-campus exit competences in academic programs (Barnes et al., 2008).

There are other forces at work causing schools to devote resources to the measurement of learning outcomes, such as metrics and data to enhance teaching, curriculums, and decision-making. Program improvement, faculty development, and budget allocations are just three areas where data about learning outcomes is being used (Preziosi et al., 1999).

Grades are often used as a measure of program effectiveness. However, there are indications that friendships, communication, and adversarial networks affect student grades (Baldwin et al., 1997). Hence, in a face-to-face program the quality of classmates may also affect grades and learning. Kohn (2002) is of the opinion that grades are a real threat to excellence in the classroom since testing is a poor indicator of student learning. Despite diverse views, professors and their academic institutions must assess students' learning and overall performance in exams and overall course outcomes for continuous improvement and accountability purposes.

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2.1. Equivalency Accountability

The concept of accountability and institutional effectiveness studies have been integrated into both the expectation and requirements of accrediting bodies. The accrediting bodies have called for accountability through assessment of multiple direct and indirect output measures that demonstrate documented learning (Barnes et al., 2008). Such measures can include but are not necessarily limited to learning achievement in course competencies, skill building in each program, graduation rates, program completion years, scores on achievement tests, licensure examination passage rates, retention rates, employment placement rates, etc. Overall, assessment, documentation of consistently achieving learning outcomes, and continuous improvement are a necessity for educational institutions today if they are to remain successful, competitive and accredited. Questions of equivalency can range from the resources provided to students in all modalities and the outcomes of student learning. A major element of delivering value for educational institutions is to assess the achievement of learning outcomes among their students and to use such results for improvement.

Most modern administrators encourage and empower faculty members to measure the level of learning in their courses through various direct and indirect measurements for continuous personal and institutional improvement purposes. It is believed that the best way to improve the institutional performance of the school is to improve the performance of individual faculty in each course. Assessing learning outcomes for personal improvement and accountability purposes tends to be a characteristic of successful faculty members as they attempt to continuously achieve extraordinary results (Mujtaba and Preziosi, 2006). It also enables professors to share strategies and methods that achieve good results with other faculty members resulting in an increase in the organization's overall effectiveness.

Higher education institutions are one of the longest lasting organizational systems that society has created for the purpose of developing experts, practitioners and researchers (Carr et al, 2004). Over the centuries, the formal educational system has changed dramatically from its beginning to today. According to Jacques (1996), as late as the mid 1800's a degree obtained from Harvard University was primarily a recognition of attendance, and the suggestion to implement grading, structured curricula, and standardized testing was considered radical. Today, universities are "standard producers of knowledge" (Jacques, 1996, p. 131).

A panoramic or "systems thinking" approach or mindset is concerned with the whole by holistically examining a specific problem, organization, situation, process, or principle (Checkland, 1999). Today's era of modern technology and artificial intelligence calls for a new paradigm, so educators, managers, and societal leaders can see their work holistically as an integrated whole rather than disconnected parts. According to Checkland (1999), the unquestioned prime value of a systems approach is that continuous learning is a good thing. For educators and work professionals alike, learning and relearning on a continuous basis through modern online technologies is valuable and critical for the long-term success of an organization and personal achievement (Kanaris and Mujtaba, 2024). "Systems thinking" is one cornerstone of a learning organization, along with personal mastery, positive mental models as to how the world works, building a shared vision, and team learning (Senge, 1990).

Educators have a responsibility to students and to the public that depend on them to provide accurate information on how students meet their goals and objectives. Of course, this responsibility extends beyond reporting to improving and enhancing the program in a purposeful manner. To meet their responsibilities and document student learning, program directors and chairs along with their faculty members often strategically create an outcomes assessment plan for their programs. These plans are usually comprehensive, systematic, structured, and goal oriented to make decisions based on data and evidence.

2.2. Analytics and Gender Disparity Measurement

Technology can greatly assist in teaching and learning of both males and females equally well when used effectively (Kanaris and Mujtaba, 2024; Whitfield, 2023). However, one could ask: Do cyberspace technologies make the teaching and learning processes more effective? Does technology help students learn the material more efficiently as shown by the results of a systematic assessment? Is technology being used to build trust and enhance learning in equivalent manners with male and female students? While technology assessment can be tackled in future research, perhaps technologies used in online education can assist students to learn the intended outcomes differently and a different amount of it in a speedier manner.

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Assessment can be seen as the process of establishing and/or understanding the learning outcomes that meet the learners' needs, assessing students to determine whether they have achieved the learning outcomes through factual evidence, documenting those results, and reflecting on how to continually improve the process of teaching, learning and learner assessment (Mujtaba, 2025b). Making the curricula visible so its usefulness in terms of demonstrated learning and results through students' performance can be documented as evidence is the true business of *assessment* (Mujtaba and Preziosi, 2006).

Researchers, academicians and administrators do agree that there is a need for more data and research in the performance achievement of students in different modalities (Henke & Russum, 2000). A starting place for more research is to assess the performance of online students and determine their capability and performance based on the technology and facilitation used for their education.

Assessing the existence of a good learning environment requires accurate data, using data properly, and using relevant metrics and analytics (Vargas et al., 2018; Vargas, 2015). Analytics is the process of collecting, analyzing, interpreting, and reporting people-related data for the purpose of improving decision making, achieving strategic objectives, and sustaining a competitive advantage in the industry (Bauer et al., 2024; Cascio & Boudreau, 2019). Human resources analytics can be used for many purposes, including for the goal of decreasing the chances of having a disparate or unintentional adverse impact on a protected group based on an employee assessment test or general hiring practice. In academia, HR analytics can be used to assess adverse impact by academic professors and administrators to make sure their students, regardless of their generational identity, gender, disability, religion, and ethnicity, are able to successfully achieve the requisite outcomes. Inequity and discriminatory practices can negatively impact students and working professionals (Lopez et al., 2022).

Disparate impact and illegal discrimination occur when a seemingly neutral policy or practice disproportionately affects a particular group of individuals, often resulting in unintended externalities (Cavico et al., 2017; Mujtaba et al., 2016). Disparate impact can have serious consequences for organizations, including legal liability, reputational damage, and decreased employee morale (Mujtaba, 2025a). Moreover, disparate impact can lead to real or perceived inequity, causing stress and anxiety among employees who feel marginalized or excluded (Mujtaba, 2025b). By using HR analytics to analyze promotion and hiring practices, organizations can identify potential areas of disparate impact and take proactive steps to address them. This not only helps to reduce legal risks but also promotes a fairer and more pleasant work environment (Mujtaba, 2022).

Recognizing the connection of gender with other identity factors, such as race, ethnicity, and experience, is crucial for learning and inclusionary teaching and management practices (Uru et al., 2024; Richards & Ridley, 1997). Understanding how these interconnecting identities influence workplace happiness can provide a more comprehensive picture of the challenges faced by different groups and generations (Mujtaba, 2024). Women, historically underrepresented in certain professions, do face unique and stressful challenges that impact their opportunities and job satisfaction (Rasool, 2021). On the other hand, proponents of gender equality argue that increasing diversity in the workplace enhances overall satisfaction by fostering varied perspectives and approaches (Mukherjee, 2024). Stereotypes and biases may influence how men and women are perceived in professional settings, which can adversely affect opportunities for advancement and overall job satisfaction of some candidates (Siocon, 2023).

Today's men and women across the globe face many personal and professional ethical dilemmas that can be taxing (Whitfield, 2023; Mujtaba et al. 2025). In the U.S., women are paid eighty-three cents for every dollar made by their male colleagues (Bauer et al., 2024). Women report higher levels of job insecurity, unequal pay, and limited opportunities for career advancement compared to their male counterparts (Kohn, 2020; Lopez et al., 2022). Women are more likely to experience workplace discrimination, including gender-based microaggressions and biases, which can contribute to feelings of isolation, underappreciation, and burnout (Shin, 2019). The dynamics of the workplace have undergone significant transformations, with a growing emphasis on equity and inclusion (Warren et al., 2019). However, amidst this pursuit, gender disparities in workplace happiness have emerged as a critical area of concern, especially for women as they may be discriminated against purposely or unintentionally.

Disparate treatment (also known as "intentional discrimination") exists when individuals in similar situations are treated differently based upon a legally protected element such as sex, race, color, religion, national origin, age, or disability status (Muffler et al., 2010). Whenever individuals are treated differently

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because of their race, sex, or the like, and there is an actual intent to treat them differently; the plaintiff must prove that there was a discriminatory motive—that is, that the employer intended to discriminate (Minenko and Mujtaba, 2024; Mujtaba, 2024). Disparate impact occurs when a hiring, selection process, or promotional practice *disproportionately* excludes a protected group from the achievement of such opportunities. As per the laws in the United State, adverse or disparate impact based on a person's gender or other such protected categories, even when it is unintentional, is illegal (Mujtaba, 2025b).

Generally, there are two types of analysis used to determine disparate impact, the four-fifths rule or the standard deviation rule which can be done through Chi-Square Test of Independence (Mujtaba, 2025a/b & 2022). In the four-fifths rule, a test has a disparate impact if the hiring rate for the minority group is less than four-fifths (80%) of the hiring rate for the majority group. The standard deviation rule uses actual probability distributions to determine adverse impact. So, academic administrators, faculty members, and human resource professionals can use a systematic process to consistently assess for the presence of any disparate impact from a test on a protected group, such as gender, by identifying the practice being applied to make "pass or fail" decisions and determining if adverse or unintentional impact exists.

3. Methodology

This study on assessment of learning outcomes is conducted at the H. Wayne Huizenga College of Business and Entrepreneurship of Nova Southeastern University to determine if students report the same level of success whether they are on campus in traditional classes or in an online modality. This study focuses on the following research question: *Is there a difference in learning outcome for traditional campus-based students vs. online students in the "Managing Workforce Diversity" course?*

The methodology for assessing learning outcomes online versus traditional campus-based face-to-face modalities involves a quantitative approach using statistical analysis. Specifically, a t-test analysis is conducted to compare the mean scores of students online and traditional face-to-face modalities. The t-test helps to determine if there is a significant difference in the learning outcomes between the two groups. Additionally, mean and standard deviation analysis is used to see the central tendency and variability of the scores in both groups, which provide insight into the distribution of scores and help identify any outliers or anomalies.

The data analysis is conducted using Microsoft Excel, which is widely used statistical software available on most computers. Once the data is entered into an Excel spreadsheet, the t-test analysis will be performed using the built-in t-test function. The mean and standard deviation will be calculated using the AVERAGE and STDEV functions in Excel. The results will be presented in tables and analysis to illustrate the findings (Mujtaba, 2025a). The analysis includes a discussion of the implications of the results, along with any limitations of the study and recommendations for future research. By using a quantitative approach and statistical analysis, this study aims to provide an objective assessment for the learning outcomes of online versus traditional, campus-based face-to-face teaching modalities.

First, the average mean average test and overall course scores of students is assessed to see if there are any significant differences based on teaching modalities. Second, to assess if a disparate impact exists based on gender, the four-fifths rule is used. As such, we can assess if course assignments and test scores lead to a disparate impact based on gender.

Using a convenience sampling methodology, the population of this study are undergraduate students who completed the "*Managing Workforce Diversity*" course as part of the requirement for the Bachelor of Science degree in the South Florida region of the United States. The data comes from students who successfully completed the course using the same assignments and exams, facilitated by the same professor either in traditional on-campus modality or through an online asynchronous modality which provided some synchronized lectures where attendance was voluntary. Since one professor taught the course using the same exact topics, lectures, and exams, one can assume a high level of objectivity in the assessment process. Students were graded based on class attendance, participation in asynchronous online discussion forums, participation in the synchronized lectures, reviewing a recently published article related to workforce discrimination, completing an experiential group exercise on "diversity audit" with an organization of their choice, completing a written paper, and taking a comprehensive final exam. Scores on the final exam were assessed to see if there are any disparities in performance based on teaching modality and gender. Also,

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students' grades were totaled for all assignments to see if there is disparity based on teaching modality, or a disparate impact based on gender at a score of 90% pass rate.

For this study's population, a total of 414 students successfully completed the course in 12 different terms between 2019 to 2024, with 224 females and 190 males. Six sections were delivered through a traditional face-to-face, campus-based format which required attendance in all sessions (171 students). The remaining sections were taught online (243 students) using the same learning outcomes, book, articles, lectures, and assignments as the campus-based format. The weekly lectures for online students were pre-recorded prior to each module, and made available so students could see them anytime at their convenience. Additionally, a written lecture was made available as required reading for each week, guiding and directing students in answering their weekly discussion questions. While the online format did not require asynchronous attendance, each term an average of 2-5 live one-hour lectures were scheduled and recorded. The recorded lectures were made available for viewing of all students enrolled in the class. While about 10% of the attendees' report working, most of these undergraduates were full-time students, majoring in business, law, medicine, psychology, education, engineering, and other fields.

3.1. The T-Test Analysis

We can assess outcomes based on average or mean scores achieved by the two different modalities (on-campus vs. online). Using Excel, we can apply an independent samples *t*-test to evaluate the effectiveness of the assignments based on on-campus and online student achievement outcomes (Mujtaba, 2025a). For the purposes of this analysis, we are concerned about the students' scores and want to see if there are disparities in their achievements based on course delivery mode. We assess students' overall knowledge based on their cumulative scores (and a final exam score). The analysis is done using an independent sample *t*-test to evaluate whether the mean score for participants is significantly different based on modality.

Table 1. Total Course Teaching Modality Scores t-Test (Assuming Unequal Variances).

	On-Campus	**Online**
Mean	87.75	91.12
Variance	52.36	39.43
Observations	171	243
df	332	
t Stat	-4.93	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.000001	
t Critical two-tail	1.97	

As shown in Table 1, online students have a significantly higher performance than campus-based face-to-face students when compared in their overall accumulated total course scores. When final exam scores were analyzed between online and campus-based students, no statistically significant differences were found based on modality or gender.

Using the final exam scores, males have an average of 87.7 and females have an average of 88.7 with no statistically significant difference (p-value 0.17) between the two groups. However, as can be seen in Table 2, using the accumulated total courses scores, males have an average of 89.27 and females have an average of 91.15 with a statistically significant difference (p- value 0.0023) between the two groups. Female students seem to have outperformed their male colleagues in overall total course performance.

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Table 2. Total Course Scores based on Gender t-Test.

	Male	**Female**
Mean	89.27	91.146
Variance	33.50	44.396
Observations	190	224
df	412	
t Stat	-3.0692	
P(T<=t) one-tail	0.0011	
t Critical one-tail	1.6486	
P(T<=t) two-tail	0.0023	
t Critical two-tail	1.9657	

As shown in the data, despite the larger variance for females, the overall *p*-value of 0.0023 shows a statistically significant difference between the two groups in their overall accumulated course scores. In other words, female students seem to do better in this course compared to their male counterparts. The diversity of assignments does appear to result in a disparate or adverse impact based on gender. As such, we can continue the analysis using the four-fifths rule and the standard deviation (chi-square test) rule.

3.2. The Four-Fifths Rule Analysis

As shown in Figure 1, using a 90% achievement level or pass rate, a total of 210 students would have a pass rate on the final exam with an average score of 94.2 (t. dev. of 2.99). Those that meet the pass rate standard are 93 males (48%) and 117 females (52%). This also means that 204 students did not pass at the selected cutoff criteria or standard. In this sample, since females have a higher pass rate, we can divide the pass rate for men by the rate for women to get an impact ratio of 93% for men, implying no disparate impact. Since the adverse impact ratio on male pass rate is 93.7%, higher than 80%, there is no evidence of adverse impact or unintentional discrimination.

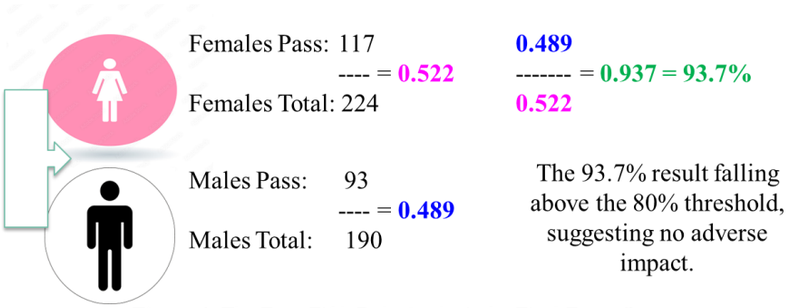


Figure 1. The Four-Fifth Rule Analysis for Final Exam Score.

3.3. The Standard Deviation Test of Independence Analysis

For the standard deviation analysis, we can apply the chi-square test of independence to assess if there is a disparate impact on a protected group using Microsoft Excel (Mujtaba, 2025a/b; Bauer et al., 2024). We have already queried the frequencies/counts of men and women who passed or failed a test at the 90% cut off level used for pass rate based on the final exam results. As such, with the observed data in hand, we are ready to apply the chi-square test of independence to assess whether there is prima facie evidence of disparate impact or intentional discrimination based on gender.

Using the Excel workbook, we can create a 2 x 2 table with the observed pass/fail frequency/count data for men and women (Table 3). We can begin by calculating the row and column marginals, to get the sums for the number of men, women, individuals who passed, and those who failed to achieve an overall score of 90%.

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Table 3. Observed Data for Final Exam.

	Pass	**Fail**	**Total**
Men	93	97	190
Women	117	107	224
TOTAL	210	204	414

Next, we can create a blank table titled expected data that we can use to calculate the frequencies/counts we would expect if the variables for gender (men, women) and outcome (pass, fail) were independent of one another, or unrelated (Table 4). To calculate the expected frequency/count for men and women who passed the knowledge test, multiply the row and column marginals that align with the cell for men who passed, and divide the product by the overall sample size (such as 190*210 / 414 = 96.38 for men's pass expected pass rate). The same can be done to get the expected fail rates for each gender.

Table 4. Expected Data for Final Exam.

	Pass	**Fail**	**Total**
Men	96.38	93.62	96.38
Women	113.62	110.38	113.62
TOTAL	96.38	93.62	96.38
	p-value – 0.5053		

With our observed and expected data tables complete, we can assess whether the observed data are significantly different than the data we would expect if the gender and outcome variables were not associated with one another. In other words, we are determining whether we should reject the hypothesis that the observed and expected data are the same. To do so, we can calculate a *p*-value associated with a chi-square test of independence. There are different ways to calculate a *p*-value in Excel, and one method is to use the CHISQ.TEST function (Bauer et al., 2024). As the first argument in the function's parentheses, we enter the array/range of cells that contain the raw data of men and women who passed or failed in the observed data table. Finally, we can enter the array/range of cells that contain the raw data of men and women who passed or failed in the expected data table (Mujtaba, 2025; Bauer et al., 2024).

The resulting *p*-value is 0.5053 and falls above the conventional cutoff value or alpha level of .05. Thus, we fail to reject the hypothesis that the observed and expected data are the same; so, we conclude that there is no evidence that the gender and test outcome variables are significantly associated with one another. In other words, we conclude the there is *no* evidence of a gender effect on the final exam scores of male and female students; so, a disparate impact does not seem to be present based on these scores. These findings confirm the t-test results which showed no statistically significant differences between males and females on the final exam test.

The t-test analysis showed a statistically significant difference in teaching modality as online students have a higher performance than campus-based face-to-face students using their overall accumulated total course scores. As such, we can now conduct the 80% rule, and the standard deviation rule based on the 90% pass using the overall accumulated total course scores to assess the presence of any disparate impact based on gender.

As shown in Figure 2, using a 90% achievement level or pass rate, a total of 269 students would have a pass rate on the total course score with an average score of 93.7 (St. dev. of 3.38). Those that meet the pass rate standard are 108 males (57%) and 161 females (72%). This also means that 145 students did not pass at the selected cutoff criteria or standard. In this sample, since females have a higher pass rate, we can divide the pass rate for men by the rate for women to get an impact ratio of 78.9% for men, implying the possibility of disparate impact. Since the adverse impact ratio on male pass rate is 78.9%, which is less than the 80% norm, there is evidence of adverse impact or unintentional discrimination.

For the standard deviation analysis, we can apply the chi-square test of independence to assess if there is a disparate impact based on gender, using the total course scores at the 90% cut off level used for pass rate. Once again, we are ready to conduct the chi-square test of independence to assess whether there is prima facie evidence of disparate impact or unintentional discrimination based on gender.

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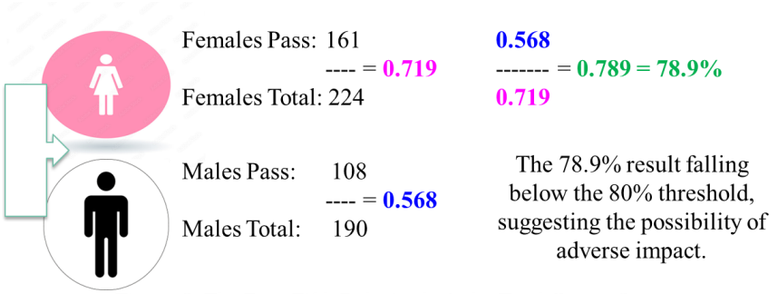


Figure 2. The Four-Fifth Rule Analysis for Total Course Score.

Using the Excel workbook, we can create a table with the observed pass/fail frequency/count data for each gender (Table 5). We can calculate the row and column marginals, based on the number of students who passed or failed to achieve an overall score of 90%.

Table 5. Observed Data for Final Exam.

	Pass	**Fail**	**Total**
Men	108	82	190
Women	161	63	224
TOTAL	269	145	414

As done previously with the final test scores, we create a blank table titled expected data that we can use to calculate the frequencies/counts we would expect if the variables for gender (men, women) and outcome (pass, fail) were independent of one another, or unrelated (Table 6). To calculate the expected frequency/count for men who passed the knowledge test, multiply the row and column marginals that align with the cell for men who passed or failed, and divide the product by the overall sample size. The same can be done for women that passed or failed.

Table 6. Expected Data for Final Exam.

	Pass	**Fail**	**Total**
Men	123.45	66.55	190
Women	145.55	78.45	224
TOTAL	269	145	414
	p-value – 0.0014		

With the observed and expected data tables complete, we can assess whether the observed data are significantly different than the data we would expect if the gender and outcome variables were not associated with one another. We can calculate a *p*-value associated with a chi-square test of independence. The resulting *p*-value is 0.0014 and falls below the conventional cutoff value or alpha level of .05. Thus, we reject the hypothesis that the observed and expected data are the same; so, we conclude that there is evidence that the gender and test outcome variables are significantly associated with one another. In other words, we conclude the there is evidence of a gender effect based on the total accumulated scores of male and female students; so, a disparate impact does seem to be present based on these total course scores.

Whenever the *p*-value is less than .05, we conclude that the relationship between the two variables is statistically significant. Since this is the case when we compare the total overall performance of students, we must look at the observed data table to determine which gender (men or women) has a disproportionately higher pass rate based on the test outcome. With a pass rate of 72%, females have a statistically significant pass rate compared to their male colleagues. As such, in this course's overall performance, the presence of adverse impact negatively impacts male students.

4. Discussion

This study found that online students performed equally or better compared to traditional campus-based face-to-face students in the "Managing Workforce Diversity" course. The results also highlighted the

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importance of considering gender differences in student performance. If the 90% cut off rate based on the total course scores were being used for hiring or promotion of employees, it would imply illegal gender discrimination against men in the U.S. Of course, since this is an academic course and the objective performance-opportunities are transparently open to everyone, it can mean that male students are not interested in the topics of the course, they are not fully engaged in the course assignments, and/or they are not fully inspired by the professor to study hard. It can also mean that females, since they are more often negatively impacted in society due to gender discrimination, are more aware of the importance of diversity, equity, and inclusionary practices. On other hand, it might mean that young female students are more engaged, better prepared, and work harder than male students in higher education. Future researchers are encouraged to continue this stream of research to determine, if in fact, female students are consistently outperforming their male counter parts.

The different methods of analysis in this study revealed a statistically significant difference in total course scores between online and campus-based students, as well as among male and female students, suggesting that the course materials and assessments did disproportionately affect one gender over the other and based on teaching modality. More specifically, females do have a higher performance achievement compared to males, and the same is true for online students compared to those who attended class on campus. This finding is encouraging, as it indicates that online courses are just as effective as traditional campus-based curriculums. Furthermore, the lack of disparate impact on the final exam suggests that the course is effectively teaching the concepts to both male and female students, which is essential for promoting equity and inclusion in the field. By promoting equity and inclusion using traditional and innovative technologies like artificial intelligence, digital twinning and even robotics, educators can drive more equitable learning practices to their students, along with higher levels of satisfaction, through face-to-face, online, hybrid formats (Nafei et al., 2024; Khanfar et al., 2024; Redmond & McGuinness, 2019). By promoting equity and inclusion in an academic classroom or culture, modern leaders and agile organizations can promote a more positive and supportive learning environment using creative and innovative practices (Aaman et al., 2024; Subramaniam et al., 2023).

The success of learning equivalency can be due to the instructor's affective teaching style in both traditional and online modalities. It is possible that male and female students are inspired differently, which must be considered by each educator to experiment and enhance future performance. The basis of affective teaching philosophy presumes a continuous working relationship, along with timely coaching, between the professor and students (Bolton, 1999). As used in this study, all instructors should use a variety of teaching strategies in all classes to accommodate diverse learning styles, including group problem solving techniques, group discussions, case analyses of recent news articles, experiential auditing, and team assignments to provide practical, engaging, and significant insight for the course (Colbeck et al., 2000; Lang & Dittrich, 1982; Shaohua & Gnyawali, 2003).

The three-tier learning system provides students with a repetitive and self-reinforcing learning environment, which culminates the students' interests by their timely engagement and continuous participation (Bloom's Taxonomy, 1956). The three-tier learning system can include a mix of lectures, technology integration to visualize complex content, and reflective discussions to encourage critical thinking (Mujtaba and Kennedy, 2006).

1. *Lecture process*: Applying theoretical frameworks for the students in a practical and applied manner. For example, the foundation of civil rights and affirmative action programs would be discussed in the course. Thus, providing students with a foundation of historical and modern theory in inclusionary management.
2. *Visual aid technology*: Engaging visuals, videos, lectures, internet searches, and artificial intelligence tools can assist students with their academic pursuits. As the student receives the lecture content, he/she will visually review the material using technology to enhance their learning and retention.
3. *Class discussion*: The synchronized and asynchronous classroom discussion phase with the students concerns the topics of the course lecture material to bridge the theoretical to the applied aspects of the course. The other areas for discussion are case studies, research paper assignments and mechanics, and relevant debates for the course. The classroom interaction phase is one of the most important aspects of adult learning as they connect theories to their profession and places of work.

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Overall, given the prevalence of neurodiversity in learners (or unique ways people's brains work), it is important for professors to continuously experiment and search for effective and creative ways to engage students based on their preferred learning styles.

5. Conclusion

The analysis of cumulative scores in the course revealed online students had a significantly higher success rate than campus-based learners. Additionally, there appears to be a disparate or adverse impact between male and female students' overall accumulated course scores, indicating that the course materials and assessments were not equitable and inclusionary for everyone since males are disproportionately impacted negatively as observed by their lower performance. This finding has important implications for practice, as it highlights the importance of creating inclusive and equitable learning environments that support the development of diverse talents in higher education institutions.

The presence of disparate impact in the workplace can have a negative impact on employee success and overall happiness. By promoting equity and inclusion in the workplace, organizations can help to reduce costly lawsuits, promote a more positive and supportive work environment, and increase employees' overall success. Fair and equitable practices can lead to positive outcomes, such as increased talent diversity, productivity, creativity, and innovation. By integrating practical gender-focused teaching strategies, academic institutions can enhance their students' well-being, improve productivity, and cultivate a merit-based learning culture that values fairness and equity for all. Future researchers should explore more nuanced teaching practices to further close gender disparities in academic performance.

Overall, despite the limitation of using a convenient sample population in one course and one institution, the findings of this study underscore the importance of periodic assessment of teaching modalities to create an effective learning environment for all students in online, hybrid, and campus-based classrooms. It is essential that educators prioritize equitable and inclusionary teaching practices to accommodate diverse learning styles while ensuring everyone has opportunities to successfully complete the course. Similarly, it is essential that entrepreneurs and managers prioritize equitable and inclusionary management practices to remove any adverse impact on protected groups and ensure everyone has equal opportunities to succeed.

Declarations and Disclosures:

AI was used to improve the language content, after which the author(s) checked the text and took full responsibility for its content.

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