

The Digital Divide as a Determinant of Student Attainment at a Selected University in the Western Cape

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Abstract

Socio-economic inequalities in South Africa remain an issue of concern. While the country has made various initiatives to address this vice, it remains critical and a threat to the attainment of democracy. Another form of inequality related to technology access; use and adoption has emerged in recent years and creating the digital divide. The purpose of this study was to explore the digital divide and its role in student attainment at higher education levels. The study adopted the quantitative research based on the Mann Whitney Test of independence to attain its objectives. Students from a class in the faculty of Business and Management Sciences at a University were split into two groups and given three hours to complete a 1000 page essay in Business Leadership. The first group of 45 students was allowed full access to digital systems in doing the assignment while the other group of 45 was confined to no access to technological and digital systems in doing the assignment. The marks were then compared using the Mann Whitney test of independence. The results of the study demonstrated significant difference between the scores of the two groups thereby suggesting that the digital divide has become a predictor of educational attainment in the digitalized higher education system. The government and other stakeholders in the education system are recommended to create policies and curriculum delivery systems that are sensitive to the digital divide.

Keywords: *Digital, Technology, Digital Dived, Higher Education, Academic Performance, Higher Education.*

Introduction

South Africa is the most unequal country in the world and there is a huge gap between the rich and the poor. This inequality has traditionally been associated with the dark history of apartheid and the failure to uniformly ensure provision of socio-economic needs across all geographical regions and social classes in the country (Mphahlele, Mokwena & Ilorah, 2021; Mabidi, 2024). Over the years, initiatives have been spearheaded to address these inequalities at the policy, national governance and legal level. While success towards creating an equal society have been attained to some extent, more remains to be done. The technological explosion has created another form of inequality which is of focus in this study. This inequality relates to the observation that some social and societies have better access to technological tools and exploit them for their benefit while others have poor access to it (Van de Werfhorst, Kessenich, & Geven, S. 2022). This is the concept of technological divide which was considered in this study within higher education at a selected institution of higher education. The nature of higher education globally experienced wide transformation as driven by the COVID-19 pandemic. The pandemic saw the transition to online teaching and learning thereby creating continued education during the educational disruptions. This, however, resulted in challenges for those who have poor access to technological and digital systems. This study is a cases study of multiracial and highly diverse university with student enrolment of from all the various socio-economic, geographical and other categories of groups in South Africa. This allowed the analysis of perspectives from the different groups on the consequences of the digital divide within their context. This is important if equality and social mobility can be attained in South Africa as envisaged by the Constitution of the Republic of South Africa, 1996.

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Literature Review

The Digital Divide

The digital divide emerged from the early days of internet use globally across various levels (macro or national, meso or departmental and micro or individual levels). Research over the years has found that the digital divide has been driven by poor access to technological infrastructure, poor skills and knowledge for the usage of technology and differences in the effects of the technologies (Chisango & Marongwe, 2021; Samuel, Faloye & Nurudeen, 2021). The digital divide is the gap that exist between those who have access to and uses ICT and those who lack the access and do not use ICT as expected (Mphahlele, et al., 2021). Chisango and Marongwe (2021) defined the digital divide as the social inequalities that exist among individuals in terms of access to Information, Communication technology (ICT), ability to use ICT for various tasks as well as frequency of use of ICT.

In a study of key research themes for analysis in the digitalisation of higher education, Mabidi (2024) found that the digital divide remains important in the realisation of digitalisation. In the study of Samuel et al. (2021) it was commented that the realisation of the benefits of digitalisation in education has not been fully attained due to the digital divide. The digital divide is interwoven in such other themes as resistance to technology adoption, marginalisation of some soio-economic groups, poor infrastructure, lack of funding as well as digital skills. In a study of key research themes for analysis in the digitalisation of higher education, Mabidi (2024) found that the digital divide remains important in the realisation of digitalisation. The digital divide is interwoven in such other themes as resistance to technology adoption, marginalisation of some socio-economic groups, poor infrastructure, lack of funding as well as digital skills. Mubindi (2024) also describes the digital divide in terms of the difference between the disadvantaged learners and the advantaged ones. Due to the digital divide there are unequal opportunities among students and the cycle of underprivilege is strengthened. Those who have better access to digital infrastructure have become more likely to succeed while those who lack them continue underprivileged in their probabilities of academic attainment (Mubindi, 2024).

Theoretical and Conceptual Framework

The study is informed from the theoretical work and conceptual framework of Wei, and Hindman (2011) who presented a widely accepted and used framework that is presently dominating studies of digital divide. Wie and Hindman (2011) breaks down the construct of digital divide in terms of three sub-constructs, namely: digital access divide, digital capability divide and digital outcome divide. The digital access divides describe the physical access disparities associated with digital technology especially in relation to hardware and software. At the same time the digital capability divide conceptualises the possession of skills and abilities to effectively use technology. People vary in their capabilities for the use of technological systems. lastly, the digital outcome is considered as the results associated with the use of technology.

Methodology

Drawing from positivism as a paradigm for research in the social sciences, this study collected quantitative data from two categories of students who participated. A class of ninety (90) final year students from the Department of Business and Management Sciences was randomly selected from the six (6) classes in that Department. Students from the class were randomly split into two Categories each with forty five (45) students using computer generated random numbers. A 1000-word essay assignment on the value of leadership in the turbulent technological contexts was given to students in each category. The first category (Category 1) was asked to do the assignment based on their study of various books and physical journals as well as other non-electronic publications in the library and were required to submit hard physical copies of their essays for marking. The second Category (Category 2) was instructed to do the assignment on both digital and non-digital resources from the internet as well as electronic library resources. Category 1 wrote the assignment in a section of the library that had no electronic gadgets and were provided with three hours to finish and submit. Category 2 students wrote the assignment in a library section with both digital and

non-digital systems and were also given three (3) hours to complete the assignment. The lecturers marked the essays out of thirty (30) and they moderated and exchanged the marking procedure until there was full agreement about the marks allocated to the students.

The study used the Mann Whitney Test of independence to determine whether the scores of category 1 students (those with low use of digital systems) and category 2 students (those with high use of digital systems) were significantly differently. The Mann Whitney test does not assume normality of data and requires two independent groups such that the independent variable is measured on a nominal scale while the dependent variable is measured on an ordinal or continuous scale. To ensure the all conditions of normality were met, the scores collected were first subjected to the normality test before the Mann Whitney Test was performed and the results of the study established. The Statistical Package for the Social Sciences (SPSS) Software version 23 was used to perform the analysis.

Results

The scores obtained from the two groups were recorded as provided in the Table 1 and Table 2. Whereas Table 1 provides the marks obtained by category 1 students (no use of digital and electronic systems), Table 2 provides the marks obtained by Category 2 students (high use of digital and electronic systems)

Table 1: Scores of Students in Category 1

23	24	10	17	10	12	11	20	16	21	12	19	12	14	18
19	13	19	12	19	12	20	19	17	11	16	8	24	12	17
12	15	16	11	10	10	13	12	12	21	11	12	11	10	9

Table 2: Scores of Students in Category 2

23	24	21	23	23	23	22	20	21	25	24	23	21	22	26
11	12	24	23	25	17	18	19	21	21	20	10	21	26	27
16	15	25	25	26	13	14	16	20	21	21	22	19	22	24

The analysis sought to establish whether there was a significant difference between the test scores of the two groups which is the alternate hypothesis for the Mann Whitney u test. The null hypothesis for the study was: The distribution of essay scores is the same across categories of the digital divide. Non-parametric statistics were appropriate when considering the nature of the study as well as the type of data analysed. Non-parametric tests have no assumptions about the population. The Mann Whitney test is non-parametric and applicable in cases where the dataset that has collected for analysis is non-normal and size of the sample is small (<50). In this case, the sample size (N=45) was small, thereby meeting the sample condition for the Mann Whitney test. The test for normality performed in this study was important to ensure that the condition of non-normality was met before conducting the Mann Whitney Test.

Test for Normality

Testing for normality generally establishes whether data was skewed or was consistent with the bell-shape of a typical normal distribution. This was performed in this study using SPSS. SPSS allows the shape of the distribution of the test scores to be viewed on histograms on which the skewness can be observed. This makes a visual appeal of the data before normality test statistics are applied. Figure 1 provides the histogram for the scores of the forty-five (45) category 1 group

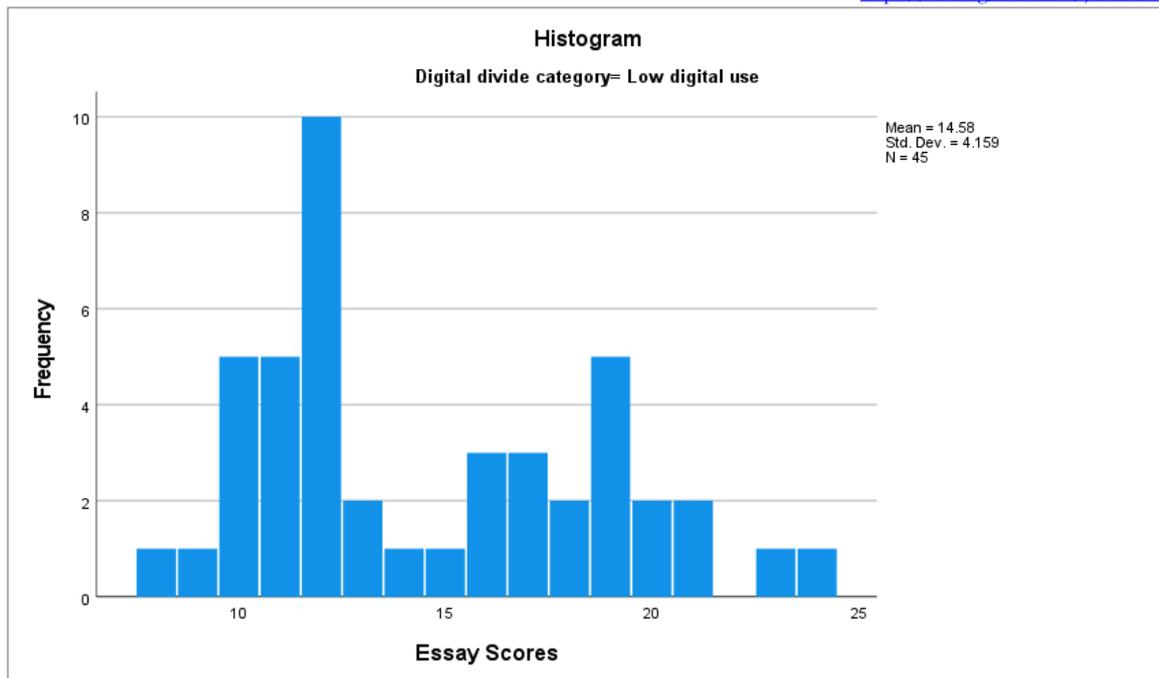
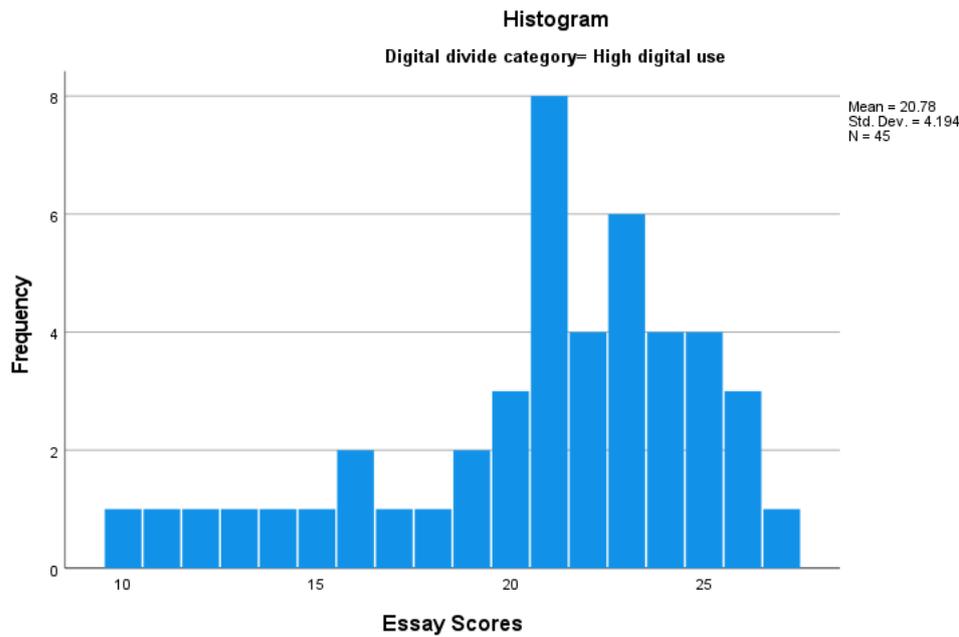


Figure 1: Distribution of the Scores for Category 1 Students

Figure 1 shows that the scores collected from category I students were positively skewed. The distribution was not consistent with the normal distribution suggesting that its analysis would follow the non-parametric procedures as opposed to parametric test to determine the significance of the difference between the scores collected from the two groups in this study. The histogram that shows the distribution of scores collected from Category 1 students is presented in Figure 2. Figure 2 demonstrates that the data was negatively skewed and also violated the normal distribution. This indicated the relevance of non-parametric techniques.



As an affirmation of the visual features of the histograms that the data collected from the two categories of students was non-normal the Shapiro-Wilk test for normality was also used. The Shapiro-Wilk test is a test for normality which is appropriate when the sample size is small (<50). While the Kolmogorov-Smirnov test is considered for larger sample sizes (>50). The test indicated that the scores collected from category 1 students was not normal ($p=0.005$; $p<0.05$) while scores from Category 2 students also not normal ($p = 0.03$; $p<0.05$). Table 2 presents these results for the Test of Normality.

Table 3: Tests of Normality

Digital divide category		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
High digital use	Essay Scores	.188	45	.000	.916	45	.003
Low digital use	Essay Scores	.221	45	.000	.923	45	.005

a. Lilliefors Significance Correction

The results of normality analysis that was performed supported the adoption of non-parametric statistical techniques and the Mann Whitney test was conducted to determine whether there was a significant difference in the scores of the two categories of students. Table 4 shows the ranks for the Mann Whitney Test. Table 4 shows that the mean rank (61.28) for the scores of students with high digital use (Category 2) was higher than those for those with low digital use (29.72).

Table 4. Ranks

	Digital divide category	N	Mean Rank	Sum of Ranks
Essay Scores	High digital use	45	61.28	2757.50
	Low digital use	45	29.72	1337.50
	Total	90		

The test statistics that emerged from the analysis are shown in Table 5. The U test statistics was 302.500 and $Z = -5.745$ and the p value of 0.0001 which is <0.05 means the null hypothesis that the scores from the two categories were similar was rejected. These results give evidence that there was a significant difference between scores of students who had high use of digital systems and of those with low use of

these systems. Generally, students who were exposed to and had unlimited use of digital systems scored better as opposed to those who did not make use of these systems.

Test Statistics ^a	
	Essay Scores
Mann-Whitney U	302.500
Wilcoxon W	1337.500
Z	-5.745
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Digital divide category

Discussion

This study makes a specific contribution to the question of the digital divide in South Africa by making a specific contribution to how it can affect educational attainment. This is highly relevant and important in South Africa where socio-economic inequalities are significant. This study found that weak or poor access to digital systems in this highly digitalized education system significantly affect educational attainment while having better access to and use of digital resources can be a key enabler of educational attainment in the South African context. These findings support general research in the literature which have found the relevance of digital and electronic systems in teaching and learning in this highly technological epoch (Chisango & Marongwe, 2021; Faloye & Ajayi, 2022; Opesemowo & Adekomaya, 2024). While the digital divide is well observed phenomenon in South Africa, it has not adequately been explored in the South African context to summarise its exact impact. In this way, the present study adds an important dimension in how the digital divide is understood and managed. The digital divide emerged from unequal access to digital tools and systems including unreliable internet or digital systems (Chisango & Marongwe, 2021; Faloye & Ajayi, 2022). This when considered together with disparities in digital literacy or poor technological skills creates an unequal educational system that tends to widen and to strengthen existing historical socioeconomic inequalities. Within the technological revolution, the fusion and proliferation of digital systems increase the desperate situation of those who are already disadvantaged (Švarc, Lažnjak & Dabić, 2021). This is likely to propel the continuation of the cycle of poverty and inequality in South Africa. Those who are socioeconomic weak will continue to lag behind on the adoption of necessary digital systems and this means their educational attainment remain hampered and the cycle of poverty and inequality continue growing (Opesemowo & Adekomaya, 2024). In South Africa the digital divide is likely to increase the geographical inequalities between the remote and poor with the urban and rich urban societies and well as racial dimensions of inequalities.

Conclusion

The study explore the digital divide as a present predictor of educational attainment in higher education. The basis was that those students with good access to and who can use digital systems perform better than those who lack access and cannot not adopt digital systems. This study found a significant difference in the scores of students who use digital systems to do academic work as opposed to those who do not use it. Consequently, this study established that the digital divide has increased existing socio-economic inequalities. It is recommended that all stakeholders in the higher education systems should cooperate in seeking lasting solution to the digital inequality as it is a threat to creating an equal society and also in addressing apartheid-era inequalities which continue to affect South Africa. Future research on the digital divide in higher education may seek to explore ways in which it can be addressed or how to reduce its impact.

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