Investigating Online Versus In-Person Learning on Student Performance

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Abstract

The urgent transformation from face-to-face teaching to an online format in Higher Education Institutions (HEIs) worldwide was carried out overnight, and almost seamlessly as a result of the COVID-19 pandemic. While the transition to adopting online assessment methods may have proved challenging for academics, recent literature in this area highlights the main reason for this—that many face-to-face universities had never implemented any form of online assessment from an institutional perspective prior to the pandemic. This issue was further exacerbated by the fact that these assessments had to be conducted remotely, bringing to the fore extraordinary challenges for HEIs, including academic dishonesty, infrastructural limitations, coverage of learning outcomes, and commitment of students to submit assessments, to name but a few. The overarching purpose of this research was to determine which teaching method proved more effective over the eight-year period. The scores of 548 students—401 traditional students and 147 online students—in an environmental science class were used to determine which instructional modality generated better student performance by means of a comparative study. This article adopts a quantitative

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approach analysing retrospective data at the selected institution to determine the performance of undergraduate students during the first and second semesters of 2019, when the institution operated in a fully face-to-face environment, and compares these results with those achieved during the first two semesters of 2020, during which the institution adopted emergency remote teaching and assessment as a result of the COVID-19 pandemic. The purpose of this article was to determine whether students performed better or worse in the online environment. Results from institutional-wide modules were compared across the two years.

Keywords: emergency remote assessment; online assessment methods; academic integrity; quality assurance.

Background

The first positive case of COVID-19 in South Africa was reported on 5 March 2020, with South Africa's 'Patient Zero' being a traveller who had returned home to South Africa from a skiing holiday in Italy (Abdool Karim 2020; Van Schalkwyk 2020). On 15 March 2020, a National State of Disaster was announced and a full national lockdown came into force on 27 March 2020, coincidentally the same day on which the first death attributed to COVID-19 happened in South Africa (Abdool Karim 2020). On 15 March 2020, all tertiary institutions in South Africa began to implement measures to meet the social isolation and lockdown mandates of the Government (Motala and Menon 2020, 80). The National Lockdown meant that all universities had to close and shift to emergency remote teaching and learning. The implementation of physical distancing and restrictions on movements have "significantly disturbed traditional educational practices" (Pokhrel and Chhetri, 2021) and the "very nature of education [was] transformed" (Schwartzman 2020, 503). The COVID-19 pandemic "represents an unprecedented risk to everyday life and most notably, it has the potential to destabilise educational, research and innovation endeavours for South Africa as a whole" (Mgutshini, Oparinde and Govender 2021, xiii).

Higher Education Institutions (HEIs) were forced to adapt their teaching, learning and assessment modality during the global pandemic due to the National Lockdown. The global pandemic led to the suspension of teaching and assessment activities globally. The urgent transformation of face-to-face classes to an online format in HEIs worldwide was carried out overnight, albeit with challenges for the South African context. Traditional modes of teaching and learning and the freedom to decide on the pedagogical approach and practice had to take a back seat, while universities struggled to save the academic year (Cranfield et al. 2021).

Literature Review

South Africa's public university system is predominantly focused on teaching and learning (Van Schalkwyk 2021). The institution which this article describes is one of 26

public universities and can be classified as a "traditional university" that is mainly research led. The institution suspended the academic programme on 16 March 2020 and campuses were closed to staff and students. The university developed a framework for this emergency shift to remote teaching and learning through the *Teaching and Learning Plan during the COVID-19 related restrictions* (Songca 2020). Central to this plan was the movement of "the academic content of our courses onto virtual platforms so that the maximum benefit for students and staff is realised." All content had to be moved onto Moodle, the official Learning Management System (LMS) implemented by the said institution. The plan mandated that a flexible blended learning mode of delivery be adopted, together with the mode of assessment being flexible continuous assessment. The principle underpinning the plan was that "no student and no staff member [should be] left behind." Staff training was provided by the University Teaching and Learning Office, Information and Communication Services (ICS) as well as colleges and schools. Student training depended on data and laptop provision. The university started preparations for remote teaching with a dry run scheduled for the month of May, with official classes set to start on 1 June 2020. The dry run conducted tests on the the readiness of information and communication, scheduling, availability, type and functionality of devices used by students and staff, adequacy of the data and connectivity, and functionality of the continuous and other assessments. Part of the preparation included, but was not limited to, attending training for developing content for online learning, developing surveys to assess how ready students were to commence with online learning and for staff to provide interactive materials that students could work through.

Whilst the institution's teaching and learning plan focused on a flexible blended learning mode of delivery, the move to a flexible continuous assessment also provided "catch-up assessments". These catch-up assessments were regarded as serving "the same purpose as the Institution's traditional supplementary examinations and special examinations."

The COVID-19 pandemic "radically changed the status quo in global higher education" (Chan, Bista and Allen 2022, 4). The most dramatic change was the shift from fully residential-only learning to fully online and remote learning environments (Chan, Bista and Allen 2022, 5; Sahu 2020). This transition to remote teaching and learning within South Africa affected many poor students; "the drastic transition from face-to-face to virtual learning methods affected many disadvantaged students from poor communities such as townships, rural areas and informal settlements" (Makombe 2021, 2). Such communities often are disadvantaged through power cuts, poor housing and limited internet connectivity, and students from these communities "not only need laptops and data to engage in online learning but also a conducive learning environment" (Makombe 2021, 5). The majority of students who study in South Africa rely on university residence accommodation to optimise their learning experience and with the national lockdown and shift to remote teaching and learning, a large number of students were impacted negatively.

Emergency Remote Teaching During the Pandemic

Emergency remote teaching and learning need to be distinguished from planned online and distance education. Instead, emergency remote teaching and learning are characterised as "a temporary shift of instructional delivery to an alternative delivery mode due to crisis circumstances" (Hodges et al. 2020, 7). It involves the use of "fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated" (Hodges et al. 2020, 7). The main objective of remote teaching is "not to recreate a robust educational ecosystem, but rather to provide temporary access to instruction and instructional support in a manner that is quick to set up and is reliably available during an emergency or crisis" (Hodges et al. 2020, 7). Emergency remote teaching and learning are characterised by a "flexible digital education deployed in haste, driven by an immediate need to adapt to rapid changes in delivery, namely as suddenly other than face-to-face, all amidst the threat and uncertainty of a widely circulating, poorly understood pathogen" (Veletsianos and Houlden 2020, 849).

This emergency transition to emergency remote teaching and learning required skills in "pivoting and agility" (Chan, Bista and Allen 2022, 13), as well as "radical flexibility" (Veletsianos and Houlden 2020). Through necessity, the shift to emergency remote teaching and learning lacked sufficient time "to adequately transition to online instruction mid-semester" (Tavares 2022, 93). Universities were forced to shift from the traditional 'presence learning', which encompasses being in the same physical space as the student, to essentially offering their modules remotely and adopting some form of 'distance education' (Verde and Valero 2021). This meant that content that was originally prepared for face-to-face teaching had to be offered online, with the 'most affected' component being assessments (Seeletso 2022, 130). Due to the COVID-19 pandemic "planned assessments and exams were suspended, and educators had to find innovative and alternative assessment strategies" (Govender and Rajkoomar 2021, 57). The facilitation of assessments via Learning Management Systems (LMS) is "a new, uncharted challenge" for higher education (Mavundla and Mgutshini 2021, 101). The use of online assessments has also presented numerous challenges for institutions of higher learning.

Assessment in Higher Education

A key component of teaching and learning within HEIs is the ability to assess students as a mechanism to monitor how well the learning outcomes and objectives have been achieved, as well as evaluate whether students have mastered the concepts taught (Ndebele and Maphosa 2013. According to Archer (2017, 2), assessment within the context of higher education has three main purposes: (1) to support learning, (2) to promote accountability, and (3) to provide certification, progress and transfer in an effort to promote and support quality education. However, within the context of Covid-19 and remote assessment, the challenge for HEIs was "to ensure student learning

outcomes and standards of educational quality are not compromised" (Naidoo, Naranjee and Sibiya 2021, 20). How and what we assess are critical to ensure that graduates develop the key competencies and skills needed to succeed on their chosen career path.

During the pandemic, various strategies and assessment types were experimented with, including setting different questions for each student, adopting online presentations, as well as combining various assessment methods (Guangul et al. 2020; Zalat, Hamed and Bolbol 2021). The extent as to how successful these strategies were in ensuring a transfer of skills and achievement of the learning objectives is still unknown. One of the biggest challenges reported by academics and institutions of higher learning regarding assessments during the pandemic was how challenging it was to ensure the integrity of the assessment, in addition to evaluating how well students understood the content taught (Xiong and Suen 2018).

However, it is imperative that, while HEI transitions and adopts online learning, they still maintain the academic integrity of their program offerings (Gamage, Silva and Gunawardhana 2020). Therefore, quality checks in the preparation for teaching, delivery of content and assessment, which include internal moderation processes, are essential to consider in this online transition (Ouma in Nakweya 2021). Given the unprecedented nature of the pandemic, institutions and academics alike were ill-prepared for the myriad of challenges online assessments would present in maintaining the academic integrity of a program, as well as how to implement quality assurance and checks that were designed for traditional assessment practices. Overnight, the mechanisms that were in place were no longer feasible in the new environment.

The four purposes of assessment are diagnostic, formative, summative and quality assurance (Luckett and Sutherland 2000). Assessment can therefore be construed as "assessment of learning" (Knight and Yorke 2003), "assessment for learning" (Black et al. 2003), and "assessment as learning" (Torrance 2007). Assessment *of* learning is typically associated with summative assessment, as these "high-stakes assessments" are designed to "sum up a person's achievement" and provide "feed-out" in the form of a mark or letter (Knight and Yorke 2003, 16). Assessment *for* learning is associated with formative assessment in that its priority is to "serve the purpose of promoting students' learning" (Black et al. 2003, 2) and to "promote student learning, achievement, and academic self-regulation" (Andrade and Heritage 2017, 1), even though it has been criticised for not being "sufficiently oriented towards developing in students the capacity for future learning beyond the present course of study" (Boud 2007, 14). Assessment *as* learning takes place where "assessment procedures and practices" completely dominate the "learning experience", while "criteria compliance" comes to replace "learning" (Torrance 2007, 282).

LMS, as online platform systems, offer the opportunity for two different types of assessment: formative and summative (Turnbull, Chugh and Luck 2021, 39). "The use of authentic assignments, being mindful of cognitive overload and the trauma students

may be carrying, and focusing on building a community in the course can increase the likelihood of student success, persistence, and learning" (Rippy and Munoz 2022, 24). COVID-19 has introduced the need to proctor examinations and other forms of assessment remotely using synchronous tools such as video to mitigate instances of cheating (Bilen & Matros, 2020). Concerns have been raised over the use of LMSs for assessments and examinations in terms of authenticity, reliability, validity, consistency and standards, as well as maintaining the integrity of assessment methods (Maddumapatabandi and Gamage 2020, 4; Senel and Senel 2021; Guangul et al. 2020; Tuah and Naing 2021; Mavundla and Mgutshini 2021). Another key concern is the impact of remote assessing on students' academic performance (Iglesias-Pradas et al. 2021; Gonzalez et al. 2020). Iglesias-Pradas et al. (2021) found that "the overall academic performance of students in emergency remote conditions was significantly better than traditional face-to-face instruction." Females have been found to perform better than males. Study and hard work are where females gain an advantage over males. They pay attention in class, read more, spend more time on their homework, take good notes in class, and also show resilience when tackling frustrating tasks (Education Elephant 2018).

While the transition to adopting online assessment methods may have proved challenging for academics, many face-to-face universities had never implemented any form of online assessment from an institutional perspective prior to the pandemic (García-Peñalvo et al. 2020; Mpungose 2020). In particular, conducting these online assessments remotely during COVID-19 brought extraordinary challenges for HEIs, owing to the "lack of preparation superimposed with the inherent problems of remote assessment, academic dishonesty, infrastructure, coverage of learning outcomes, and commitment of students to submit assessments" (Guangul, Suhail and Khalit et al. 2020; Şenel and Senel 2021; Elzainy, Sadik and Abdulmonem 2020). COVID-19 was "the greatest challenge" to education (Daniel 2020). It is within this context that the need for this study emerged.

As part of a broader study focused on understanding the diverse assessment practices adopted by academics and their impact on students' performance, this article investigates the impact of the new assessment methods adopted by academics during the transition to emergency remote assessment on overall module results. More specifically, this article sets out to determine whether there was a difference in the performance of undergraduate students at the end of 2019 and 2020. Amongst other things, it is envisaged that the outcome of this article will inform subsequent in-depth, qualitative investigation on how academics have adapted their assessment practices on virtual learning platforms with a view to contributing to policy decisions.

Research Methodology

This article adopts a quantitative approach. Retrospective data were requested from the institutional intelligence (II) section at the selected institution to determine the

performance of undergraduate students during the first and second semesters of 2019 when the institution operated in a fully face-to-face environment. These results were compared with those achieved during the first two semesters of 2020, during which the institution adopted emergency remote teaching and assessment due to the COVID-19 pandemic. In 2019, students' summative assessments predominantly comprised a combination of coursework—tests, assignments, presentations, Objective Structured Clinical Examinations (OSCEs), and so on—marks and semester/year-end examination marks. The former accounted for 50% of the semester/year mark in many modules, while the latter reflected the balance. During the pandemic in 2020, the institution emphasised continuous assessments, such that the semester/year mark focused on coursework marks only in many modules.

Results from institutional-wide modules were compared across the two years based on the average score and the number of students per module. Further subgroup analyses were performed based on student age, year of study, gender, quintile of the school attended, socio-economic status, matric points, the need for financial aid or not, and place of residence. This analysis entailed the use of a parametric independent t-test. A t-test is a statistical tool that points out sample differences based on the mean and standard deviation. For Banda (2018), the "t-test is a parametric test that works on normally distributed data and compares two means."

The modalities were as follows. Each student has a mark for each course they did in 2019 and 2020. Because Table 1 is about comparing student marks between 2019 and 2020 (determining the effect of online versus face-to-face teaching), taking into consideration gender, quintile, funding etc, the unit of measure needs to be 'the student.' For this reason, marks for each student were averaged across all the courses they did in 2019. The same is done for 2020. Each student will have an average mark for each year. In addition to this, for each student, there is data for both years which is categorised by gender, FTEN, quintile, funding, residence, and matric points. These variables are the same for the two years. However, the study year (PERSTUDY) will change from 2019 to 2020. Those who recorded per study as 1 in 2019 will have it as 2 in 2020; those with 2 in 2019 will have 3 in 2020, etc.

In order to determine the effect of the change in teaching, the analysis will be done for each category of PERSTUDY independently. So, when PERSTUDY = 1, we will determine if those in their first year of study in 2019 do better/worse than those in their first year of study in 2020. This way, no student is in both groups (2019 and 2020), so the cases are independent (no repeated measures). The same is done for PERSTUDY= 2, 3, and 4—for all undergraduate students. Normality was checked for each analysis. If normality was skewed, a non-parametric test was selected. An independent samples t-test is performed (or Mann-Whitney U in the case of severe deviation from normality) to do this analysis. The Statistical Package for the Social Sciences (SPSS) version 27 was used to manipulate the data.

Gatekeeper consent and ethical clearance (Protocol Reference number: HSSREC/00003054/2021) were obtained for the study.

Results

In total 544 140 examination opportunities (number of opportunities for individual students to take a test) were evaluated across the university. The tables below compares the performance of students in 2019 and 2020 using specific variables. A comparison is made of the performance of students in 2019 against 2020 by gender, First Entry (FTEN) Status, year of study, the quintile the student is from, sources of funding, having National Student Financial Aid Scheme (NSFAS) or not, university residence (in university residence or not) and matric marks obtained. The quintile of a school is the rating from the Department of Basic Education. Students from Q1 come from very disadvantaged schools and students from Q5 come from more advantaged schools.

Tables 1a-c outline the mean differences in scores based on variables identified by study year.

Table 1a: Analysis of Variable Categories: Study Year 2

Variable	Category	2019		2020		Independent samples t-test		
		N	Average Mark	N	Average Mark	t	df	P
Full sample		10596	59.34	10344	58.32	7.633	20339.93	<.001
Gender	Male	4204	58.0	4181	58.36	-1.704	7961.2	.088
	Female	6392	60.22	6163	58.29	11.425	12370.7	<.001
FTEN	F	8180	59.75	8018	58.33	9.654	15862.5	<.001
	T	70	64.19	46	58.72	2.720	111.4	.008
	E	507	61.67	448	58.64	4.296	932.7	<.001
	N	1839	56.68	1832	58.19	-4.122	3500.8	<.001
QUINTILE	1	1265	58.46	1364	58.02	1.197	2495.9	.232
	2	1936	58.19	2031	58.36	-.575	3867.8	.565
	3	2040	58.60	2128	58.57	.114	4019.1	.909
	4	1656	58.97	1566	58.32	1.944	3113.3	.052

	5	2646	60.90	2315	58.29	9.375	4918.0	<.001
Funding (NSFASYN)	No	3273	61.68	2511	58.39	11.601	5773.2	<.001
	Yes	7323	58.29	7833	58.30	-.015	14721.6	.988
Residence (RESAPRYN)	No	5068	60.26	4343	58.13	9.956	9328.3	<.001
	Yes	5528	58.49	6001	58.45	.231	11092.3	.817
MATRIC POINTS	<20	692	68.61	385	58.66	14.399	754.2	<.001
	20-29	3462	56.77	3361	58.25	-6.738	6821.0	<.001
	30-39	5730	58.48	6023	58.32	.980	11247.2	.327
	40+	222	66.18	159	59.04	8.039	376.5	<.001

FTEN: as F – First Entry (first entry into tertiary study from matric), T – External Transfer (A student coming from another institution), E – Entering (internal transfer, students who have changed between two different approved qualifications), and N – non-entering (student returns to the same approved qualification as their last registration).

Table 1b: Analysis of Variable Categories: Study Year 3

Variable	**Category**	**2019**		**2020**		**Independent samples t-test**		
		N	**Average Mark**	**N**	**Average Mark**	**t**	**df**	**P**
Full sample		10803	58.10	10496	58.15	-.343	21165.18	.731
Gender	Male	4565	56.69	4388	58.21	-7.516	8824.6	<.001
	Femae	6238	59.14	6108	58.10	5.987	12326.8	<.001
FTEN	F	2	61.00	2	60.50	-	-	.667*
	T	0		0		-	-	-
	E	208	57.00	170	58.00	-	-	.959*
	N	10591	58.11	10324	58.15	-.324	20770.4	.746
QUINTILE	1	932	58.01	978	57.97	.092	1872.	.927

Variable	Category	2019		2020		Independent samples t-test		
		N	Average Mark	N	Average Mark	t	df	P
							2	
	2	1498	57.89	1502	58.07	-.516	2977.1	.606
	3	1623	57.05	1734	58.18	-3.499	3238.1	<.001
	4	1929	57.59	1808	58.12	-1.716	3734.7	.086
	5	3609	59.00	3338	58.00	-	-	.002
Funding (NSFASYN)	No	4050	58.00	3086	58.00	-	-	.393
	Yes	6753	57.83	7410	58.08	-1.644	13916.8	.100
Residence (RESAPRYN)	No	5409	59.00	4859	59.00	-	-	.005
	Yes	5394	57.31	5637	58.05	-4.203	10850.3	<.001
MATRIC POINTS	<20	150	59.07	93	57.16	1.446	230.0	.149
	20-29	2991	56.31	2718	58.31	-8.260	5707.0	<.001
	30-39	6893	58.00	6899	58.00	-	-	outline
	40+	191	62.68	211	58.38	4.346	357.0	<.001

Table 1c: Analysis of Variable Categories: Study Year 4

Variable	Category	2019		2020		Independent samples t-test		
		n	Average Mark	N	Average Mark	t	df	P
Full sample		3569	61.05	4014	58.24	13.723	7581.0	<.001
Gender	Male	1493	59.61	1736	57.98	5.132	3227.0	<.001
	Femae	2076	62.08	2278	58.44	13.748	4352.0	<.001
FTEN	F	0		0		-	-	-
	T	0		0		-	-	-
	E	2	58.50	44	59.70	-.170	44.0	.865

Variable	Category	2019		2020		Independent samples t-test		
		n	Average Mark	N	Average Mark	t	df	P
	N	3567	61.05	3970	58.23	13.779	7535.0	<.001
QUINTILE	1	402	60.31	472	58.20	3.966	871.6	<.001
	2	531	60.05	706	58.59	2.943	1235.0	.003
	3	612	59.76	709	58.41	2.803	1319.0	.005
	4	632	60.19	706	58.17	4.050	1336.0	<.001
	5	1019	62.47	1042	58.12	10.793	2042.8	<.001
Funding (NSFASYN)	No	1458	61.58	1419	58.14	9.608	2856.7	<.001
	Yes	2111	60.69	2595	58.30	9.721	4585.5	<.001
Residence (RESAPRYN)	No	1746	62.22	1834	58.27	12.869	3524.5	<.001
	Yes	1823	59.93	2180	58.22	6.294	3920.4	<.001
MATRIC POINTS	<20	58	60.09	45	57.09	1.522	101.0	.131
	20-29	781	59.03	815	57.88	1.521	94.3	.132
	30-39	2274	60.77	2647	58.44	2.808	1594.0	.005
	40+	119	63.54	132	57.36	2.813	1591.9	.005

The analysis shows that marks worsened significantly from 2019 to 2020 across most defined variables. Overall, students in study years 2 and 4 had a significant drop in marks between 2019 and 2020. Females in particular had significantly lower marks in study year 2, 3 and 4 in 2020.

All categories of FTEN students from study year 2 had worse marks in 2020 compared to their mean marks in 2020 but no significant changes were noted in study year 3. In study year 4 only non-entering students had a significant drop in marks in 2020.

Students in study year 2 from quintile 5 schools had a significant drop in 2020. In contrast, students from study year 3 from quintile 3 and 5 schools had significantly better marks in 2020. In study year 4 students from all quintiles had significantly worse marks in 2020. Self-funded students performed significantly worse in 2020 for study

year 2, and both self-funded and funded students had significantly worse scores in 2020 in study year 4. Students from study year 2 residing outside university residences performed significantly worse in 2020 while students living in university residences posted no statistically significant differences in the two years under review.

Students in study year 2 with less than 20 matric points and more than 40 matric points had performed better in 2019 than in 2020 while students with 20-29 matric points performed better in 2020. Students in study year 3 with 20-29 matric points also performed better in 2020 while students with more than 40 matric points performed worse in 2020. In study year 4 students with 30 or more matric points performed better in 2019.

Further analysis using academic levels from the various schools is shown in Table 2. The question here was: Were there statistically significant differences in average scores in 2020 compared to 2019 by academic level in each of the schools at UKZN? Each school at UKZN is given a specific code. Those with * next to p in the table below have been analysed using the Mann-Whitney test.

Table 2: Performance per academic level in each school

School code	Student Level	2019		2020		Mean difference	t	df	P
		N	Mean	n	Mean				
2180	2	2	26.00	3	62.33	-36.333	-1.858	3	0.394
2181	1	518	56.09	515	58.22	-2.131	-3.939	1031	<.001
2181	2	741	55.46	556	58.54	-3.081	-6.606	1295	<.001
2181	3	1038	55.42	882	57.54	-2.121	-5.293	1918	<.001
2181	4	14	59.07	66	61.00	-1.929	-.701	78	0.485
2182	1	2108	56.96	2020	58.54	-1.577	-5.138	4126	<.001
2182	2	1055	51.75	893	58.39	-6.641	-15.326	1946	<.001
2182	3	502	51.74	477	57.78	-6.039	-10.503	977	<.001
2182	4	8	53.88	13	58.38	-4.510	-.927	19	0.365
2183	1	53	52.09	13	57.31	-5.213	-1.760	64	0.083
2183	2	480	55.44	277	58.32	-2.882	-4.115	755	<.001
2183	3	334	58.28	465	58.19	.084	.142	797	0.890
2183	4	374	63.11	474	57.68	5.430	9.023	846	<.001
2184	1	81	57.43	86	56.90	.537	.389	165	0.701
2184	2	441	56.71	382	58.83	-2.118	-3.312	821	0.001
2184	3	690	52.66	674	57.91	-5.257	-10.411	1362	<.001

School code	Student Level	2019		2020		Mean difference	t	df	P
		N	Mean	n	Mean				
2184	4	2	48.50	8	56.38	-7.875	-1.126	8	0.293
2185	1	1130	60.88	914	58.43	2.446	5.575	2042	<.001
2185	2	603	53.81	674	58.13	-4.321	-8.295	1275	<.001
2185	3	433	57.06	477	57.87	-.814	-1.217	908	0.232
2185	4	27	57.59	22	56.95	.638	.216	47	0.823
2281	3	1	.00	2	49.00	-49.000	-3.143	1	0.196
2281	4	239	63.25	247	57.78	5.470			<.001*
2282	1	240	62.66	241	57.83	4.833	5.073	479	<.001
2282	2	419	63.19	374	59.10	4.082	6.343	791	<.001
2282	3	499	66.03	528	58.30	7.735			<.001*
2282	4	345	65.49	400	57.96	7.527	11.154	743	<.001
2283	1	344	71.45	352	57.83	13.615	20.131	694	<.001
2283	2	277	69.12	263	58.82	10.305	12.057	538	<.001
2283	3	359	67.62	383	57.79	9.825			<.001*
2283	4	22	54.45	13	59.31	-4.853	-1.271	33	0.213
2284	1	644	71.79	295	58.79	13.007			<.001*
2284	2	66	63.30	61	59.69	3.615	2.561	125	0.013
2284	3	24	69.58	24	59.25	10.333	3.368	46	0.002
2284	4	80	66.11	73	58.26	7.852	6.019	151	<.001
2381	1	1295	58.71	2218	58.23	.477	1.628	3511	0.097
2381	2	1560	57.72	1011	58.24	-.528	-1.515	2569	0.130
2381	3	1570	58.36	1632	58.49	-.125	-.398	3200	0.691
2381	4	212	62.11	236	57.01	5.100	6.344	446	<.001
2382	1	2030	55.76	1637	58.45	-2.683	-8.865	3665	<.001
2382	2	1013	56.32	1160	58.50	-2.184	-5.438	2171	<.001
2382	3	752	57.18	800	58.00	-.820	-1.728	1550	0.084
2382	4	31	56.68	12	56.08	.594	.169	41	0.867
2383	1	150	57.26	162	57.61	-.351			.884*
2383	2	172	58.13	171	58.12	.017			.572*
2383	3	250	57.75	284	57.81	-.054			.143*
2383	4	2	63.00	1	64.00	-1.000	-.289	1	0.821
2384	1	1319	61.65	1313	58.31	3.341	11.344	2630	<.001
2384	2	949	61.11	1267	58.19	2.919	8.489	2214	<.001
2384	3	1373	64.22	924	58.30	5.927	18.418	2295	<.001

School code	Student Level	2019		2020		Mean difference	t	df	P
		N	Mean	n	Mean				
2384	4	1330	61.65	1549	58.44	3.213			<.001*
2385	1	160	53.30	180	58.98	-5.678	-5.087	338	<.001
2385	2	131	56.93	169	58.94	-2.010	-1.936	298	0.054
2385	3	262	56.35	273	58.96	-2.605	-3.111	533	0.002
2385	4	3	60.33	9	54.67	5.667	.758	10	0.466
2386	1	160	57.34	121	56.31	1.023	.840	279	0.401
2386	2	187	56.64	174	58.39	-1.743	-1.885	359	0.060
2386	3	401	56.70	487	57.80	-1.098	-1.841	886	0.063
2386	4	8	58.50	7	58.57	-.071	-.014	13	0.989
2482	1	211	57.74	143	58.59	-.855	-.850	352	0.396
2482	2	814	53.90	649	57.87	-3.970	-8.361	1461	<.001
2482	3	1238	55.26	1140	58.48	-3.224	-8.402	2376	<.001
2482	4	195	53.21	159	58.12	-4.909	-5.237	352	<.001
2483	1	61	52.85	53	58.40	-5.544	-2.336	112	0.021
2483	2	291	56.83	217	59.02	-2.190	-2.575	506	0.007
2483	3	606	56.66	555	58.00	-1.333	-2.506	1159	0.012
2483	4	624	57.88	677	58.82	-.943	-1.974	1299	0.049
2484	1	92	57.82	80	58.16	-.347	-.258	170	0.797
2484	2	160	57.04	183	58.35	-1.312	-1.299	341	0.195
2484	3	468	57.97	488	58.54	-.569	-.933	954	0.351
2484	4	53	56.43	48	58.15	-1.712	-.994	99	0.335

Significantly improved results were noted in 21 academic levels in each of the schools, and non-significant improvements in mean scores were recorded in 23 academic levels in 2020. Non-significant worse mean scores were noted in eight academic levels and 19 academic levels reported significantly worse mean scores in 2020. Some schools (2282, 2284, 2384) reported significantly worse scores at all academic levels in 2020 while one school (2483) reported significantly improved scores across all academic levels in 2020.

Tables 4a-d provide performance per qualification for undergraduate students based on their academic levels. Students' performance in the first to fourth year was compared in 2019 and 2020 based on the qualification type.

Table 3a: Performance per Qualification: Student Level 1

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
ADMUS	3	63.67	1	61.00	2.667	.326	2	0.776
B-ART	737	55.58	870	58.53	-2.956	-6.713	1605	<.001
B-AUDI	35	67.34	33	56.42	10.919	5.693	66	<.001
B-COM	317	55.07	266	58.36	-3.285	-4.756	581	<.001
B-DTH	59	66.85	33	57.39	9.454	4.771	90	<.001
B-MDSC	60	65.52	1	63.00	2.517	.269	59	0.789
B-NUR	79	66.33	79	58.10	8.228	5.905	156	<.001
B-PHAM	121	73.43	113	57.93	15.501	16.410	232	<.001
B-PHYS	66	62.91	63	57.30	5.608	3.551	127	0.001
B-SLP	34	64.62	1	46.00	18.618	2.317	33	0.027
B-SPS	67	53.36	78	57.03	-3.667	-1.923	143	0.065
BACHT	51	53.90	36	58.67	-4.765	-2.061	85	0.042
BADMIN	171	58.78	102	57.91	.872	.806	271	0.421
BAGM	16	49.94	13	57.00	-7.063	-2.038	27	0.051
BAGRAE	19	62.32	18	57.44	4.871	1.759	35	0.087
BAIST	82	53.10	98	57.18	-4.086	-3.021	178	0.003
BAMDP	35	62.00	21	60.10	1.905	.643	54	0.523
BAMUS	39	60.08	35	58.34	1.734	.726	72	0.470
BAPPL	175	52.21	181	57.83	-5.629			<.001*
BARCHS	45	57.22	43	60.09	-2.871			0.707*
BAVA	19	55.53	27	57.56	-2.029			0.729*
BBADM	89	59.21	72	58.10	1.116	.760	159	0.448
BBSC	43	59.49	1	61.00	-1.512	-.167	42	0.868
BCOA	391	62.29	6	60.33	1.953	.478	395	0.633
BCOF-A	48	73.25	24	58.92	14.333	6.196	70	<.001
BCOF-G	205	67.00	219	57.97	9.023			<.001*
BED-FP	294	60.49	287	57.80	2.692	4.402	579	<.001
BED-IP	298	60.25	289	57.92	2.324	3.841	585	<.001
BED-SF	698	63.11	729	58.67	4.437	11.298	1425	<.001
BMDS-P	93	60.82	93	57.94	2.882	2.210	184	0.028
BMUSC	22	58.55	15	59.40	-.855	-.247	35	0.807
BOCTH	45	65.53	43	60.07	5.464	3.139	86	0.002

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
BOPT	66	64.52	63	58.70	5.817	4.284	127	<.001
BS-CCT	39	52.44	38	60.42	-7.985	-3.248	75	0.002
BS-CHS	3	62.33	3	53.67	8.667	1.303	4	0.262
BS-ENS	100	55.29	125	57.76	-2.470	-2.007	223	0.046
BSAAPS	25	53.80	15	60.60	-6.800	-2.352	38	0.024
BSAPC	51	60.47	73	60.27	.197	.119	122	0.905
BSBLS	103	56.92	141	58.42	-1.496	-1.336	242	0.183
BSC-AB	10	49.50	9	60.11	-10.611	-2.893	17	0.010
BSC-AE	18	51.61	20	58.10	-6.489	-2.457	36	0.019
BSC-AG	74	57.22	78	58.45	-1.233	-.878	150	0.381
BSC-PS	8	54.75	5	58.80	-4.050	-.784	11	0.449
BSCA	449	52.31	422	58.55	-6.238	-10.116	869	<.001
BSCA	3	53.00	6	58.83	-5.833	-1.010	7	0.346
BSCMB	43	58.19	48	57.54	.644	.314	89	0.758
BSCSIT	143	59.56	150	57.59	1.973	1.590	291	0.115
BSGLS	53	52.96	46	57.96	-4.994	-3.461	97	0.001
BSIAB	14	51.50	16	59.06	-7.563	-2.883	28	0.007
BSLES	225	56.02	220	58.49	-2.469			<.001*
BSM	140	52.66	135	59.07	-6.402	-4.778	273	<.001
BSOWK	180	57.41	187	58.13	-.728	-.903	365	0.367
BSS	1075	56.42	1114	58.02	-1.608	-4.432	2187	<.001
BSS4	796	57.52	1136	58.55	-1.031	-2.521	1930	0.012
BSSGBE	60	54.00	123	58.98	-4.976	-4.023	181	<.001
BSSGEM	137	57.37	168	57.81	-.437	-.484	303	0.628
BSSHSE	78	58.06	78	56.24	1.821			0.177*
BSSIWL	46	59.89	19	55.68	4.207	1.784	63	0.157
BTHEO3	8	54.25	19	57.42	-3.171	-.575	25	0.696
D-JPM	23	55.61	11	57.91	-2.300	-.634	32	0.531
D-MUSP	44	57.16	19	56.63	.528	.169	61	0.866
ENG-AG	32	52.19	5	58.00	-5.813			0.248*
ENG-CE	54	54.31	41	56.98	-2.661	-1.442	93	0.153
ENG-CH	88	54.53	67	59.93	-5.391	-3.387	153	<.001
ENG-CV	103	57.16	76	59.22	-2.068	-1.550	177	0.123
ENG-EC	70	52.00	34	57.76	-5.765	-3.526	102	0.001

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
ENG-EL	96	53.38	61	60.51	-7.133	-5.242	155	<.001
ENG-LS	45	52.91	29	59.00	-6.089	-2.672	72	0.009
ENG-ME	101	59.15	78	57.82	1.328	.949	177	0.323
ENGEAP	111	58.10	151	58.50	-.398	-.304	260	0.776
LLB4	349	58.22	352	58.59	-.367	-.503	699	0.615
NDPEN	22	56.77	5	64.60	-7.827	-1.233	25	0.229
NDPHS	58	63.40	58	57.05	6.345	3.564	114	0.001
NDPIN	645	71.80	295	58.79	13.012			<.001*
NDPMS	29	54.10	16	59.06	-4.959	-1.487	43	0.144
NDPSA	2	58.00	6	61.50	-3.500	-.270	6	0.796

In the first year, 23 cohorts of students improved their marks significantly, and 21 cohorts of students improved their marks but not significantly compared to their fellow students who did the course in 2019. Sixteen cohorts of students from the first year performed significantly worse than their fellow students doing the same course in 2019, and 16 groups performed worse than their fellow students in 2019 but not significantly.

Table 3b: Performance per Qualification: Student Level 2

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
B-ART	728	57.09	655	58.34	-1.253	-2.630	1381	0.009
B-AUDI	37	62.08	32	60.34	1.737	1.091	67	0.279
B-COM	488	54.20	383	57.82	-3.626	-6.272	869	<.001
B-DTH	72	69.90	54	57.57	12.329	8.277	124	<.001
B-MDSC	60	59.13	42	60.48	-1.343	-.790	100	0.431
B-NURS	89	60.03	73	59.22	.815	.594	160	0.553
B-PHAM	121	64.22	116	59.24	4.982	4.248	235	<.001
B-PHYS	59	64.58	66	58.36	6.213	4.259	123	<.001
B-SLP	32	63.31	30	57.70	5.613	2.971	60	0.004
B-SPS	60	52.42	43	58.37	-5.955	-3.185	101	0.002
BACHT	68	59.97	43	58.28	1.692	1.125	109	0.263
BADMIN	135	52.40	135	58.75	-6.348	-6.028	268	<.001
BAGM	9	48.44	6	55.17	-6.722	-1.347	13	0.201
BAGRAE	16	56.31	23	59.09	-2.774	-.921	37	0.318
BAIST	27	60.70	47	57.06	3.640	1.731	72	0.088

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
BAMDP	11	58.55	10	64.30	-5.755	-1.688	19	0.108
BAMUS	22	55.27	27	59.15	-3.875	-1.592	47	0.118
BAPPL	73	56.38	106	59.19	-2.805	-2.163	177	0.032
BARCHS	38	62.76	41	57.51	5.251	2.809	77	0.006
BAVA	16	60.19	15	56.40	3.788	.861	29	0.396
BBADM	35	57.43	73	57.81	-.380	-.211	106	0.833
BBSC	28	61.50	40	57.70	3.800	1.497	66	0.139
BCOA	711	54.89	534	57.36	-2.474	-4.579	1243	<.001
BCOF-A	37	51.65	47	58.34	-6.692	-3.890	82	<.001
BCOF-G	132	51.93	210	58.90	-6.973	-8.786	340	<.001
BED-IP	1	55.00	281	58.99	-3.993	-.504	280	0.615
BEFET	145	60.59	2	65.00	-4.407			0.682*
BEFIP	104	61.92	3	63.33	-1.410	-.254	105	0.800
BEISP	14	57.64	1	76.00	-18.357	-2.733	13	0.017
BESFT	582	61.04	15	57.00	4.038	2.020	595	0.159
BMDS-P	88	57.47	80	58.06	-.597	-.379	166	0.701
BMUSC	7	55.43	5	61.40	-5.971	-1.216	10	0.252
BOCTH	43	61.33	43	60.91	.419	.253	84	0.801
BOPT	61	58.54	62	57.13	1.412	1.039	121	0.301
BS-CCT	36	49.75	34	56.00	-6.250	-2.936	68	0.005
BS-CHS	7	60.29	11	58.55	1.740	.365	16	0.720
BS-ENS	79	53.87	111	60.14	-6.262	-5.270	188	<.001
BS-PD	60	61.07	1	64.00	-2.933	-.295	59	0.769
BSAAPS	37	54.59	32	57.22	-2.624	-1.254	67	0.214
BSAPC	72	50.69	48	58.46	-7.764	-4.155	118	<.001
BSBLS	118	56.23	56	59.59	-3.360	-2.277	172	0.024
BSC-AB	8	48.00	10	59.80	-11.800	-2.826	16	0.012
BSC-AE	12	54.25	14	57.79	-3.536	-1.149	24	0.262
BSC-AG	52	54.87	45	56.29	-1.424	-.757	95	0.451
BSC-PS	6	55.33	5	64.60	-9.267	-2.300	9	0.047
BSCA	221	48.02	278	58.67	-10.650	-11.839	497	<.001
BSCA	2	68.00	4	62.50	5.500	1.626	4	0.179
BSCMB	41	54.76	31	60.48	-5.728	-2.860	70	0.006
BSCSIT	173	57.35	140	57.86	-.517	-.415	311	0.666

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	N	Mean				
BSGLS	32	53.69	40	58.53	-4.838	-2.655	70	0.007
BSIAB	15	51.00	11	56.82	-5.818	-2.015	24	0.055
BSLES	382	53.53	325	58.78	-5.253	-7.295	705	<.001
BSM	111	53.85	206	58.39	-4.546	-3.435	315	0.002
BSOWK	119	58.88	168	59.04	-.159	-.198	285	0.843
BSS	1266	56.85	983	58.35	-1.504	-3.956	2247	<.001
BSS4	152	56.07	132	59.36	-3.290	-2.991	282	0.003
BSSGBE	45	57.96	43	61.33	-3.370	-2.115	86	0.039
BSSGEM	306	55.92	137	58.36	-2.443	-3.183	441	0.005
BSSHSE	92	57.66	73	58.33	-.666			0.522*
BTHEO3	5	61.00	5	58.20	2.800	1.212	8	0.260
D-MUSP	7	36.57	1	53.00	-16.429	-.553	6	0.600
ENG-AG	36	53.25	32	58.78	-5.531	-2.581	66	0.012
ENG-CE	41	55.17	33	57.52	-2.344	-1.015	72	0.313
ENG-CH	158	53.94	100	58.07	-4.133	-3.736	256	<.001
ENG-CV	139	55.17	114	58.62	-3.450	-3.349	251	0.001
ENG-EC	77	53.10	47	58.70	-5.598	-3.502	122	0.001
ENG-EL	134	53.08	93	59.40	-6.316	-6.067	225	<.001
ENG-LS	38	59.37	27	58.26	1.109	.455	63	0.651
ENG-ME	154	55.29	110	57.82	-2.532	-1.954	262	0.041
ENGEAP	49	51.00	11	61.55	-10.545	-3.874	58	<.001
LLB4	504	56.11	352	58.39	-2.284	-3.502	854	<.001

In the second year in 2020, most students (30 groups) doing the same course as the students in 2019 performed significantly better while 19 groups had better mean scores than their colleagues from the preceding year. Sixteen groups of students doing the same course in 2020 performed worse but not significantly, while only four groups performed significantly worse in 2020.

Table 3c: Performance per Qualification: Student Level 3

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	n	Mean				
B-ART	835	56.86	985	58.11	-1.254	-2.984	1818	0.003
B-AUDI	32	65.81	37	58.86	6.948	3.617	67	0.001
B-COM	812	56.07	797	58.48	-2.415	-5.237	1607	<.001

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	n	Mean				
B-DTH	40	68.68	52	60.79	7.887	5.540	90	<.001
B-MDSC	44	64.75	60	58.27	6.483	3.983	102	<.001
B-NURS	76	67.26	87	60.34	6.918			<.001*
B-PHAM	107	71.83	120	58.66	13.173	10.587	225	<.001
B-PHYS	61	69.90	54	57.83	12.068			<.001*
B-SLP	33	57.30	33	56.58	.727	.387	64	0.700
B-SPS	68	57.50	68	58.10	-.603	-.339	134	0.735
BACHT	70	54.97	100	58.21	-3.239	-2.328	168	0.013
BADMIN	144	54.32	190	58.34	-4.017	-3.950	332	<.001
BAGM	7	51.29	8	58.13	-6.839	-1.477	13	0.163
BAGRAE	16	59.19	13	54.23	4.957	1.693	27	0.102
BAHRM	22	59.86	30	57.80	2.064	.623	50	0.536
BAIST	36	60.17	31	57.10	3.070	1.405	65	0.165
BAMDP	4	64.00	5	56.80	7.200	1.115	7	0.302
BAMUS	21	62.95	24	59.67	3.286	1.355	43	0.182
BAPPL	118	57.54	93	57.33	.209	.165	209	0.869
BARCHS	71	58.86	65	56.51	2.351			0.003*
BAVA	18	65.72	17	58.29	7.428	2.531	33	0.016
BBADM	72	58.92	53	58.58	.332	.197	123	0.844
BBSC	43	62.37	27	56.41	5.965	2.628	68	0.011
BCO4-G	6	47.67	1	56.00	-8.333	-.503	5	0.636
BCOA	553	56.09	502	58.31	-2.224	-3.799	1053	<.001
BCOF-A	26	50.35	28	59.00	-8.654	-4.601	52	<.001
BCOF-G	110	51.54	124	58.60	-7.060	-7.287	232	<.001
BEECD	142	66.35	93	60.34	6.008	6.000	233	<.001
BEFET	777	63.87	149	57.11	6.760	10.375	924	<.001
BEFIP	73	66.67	99	58.14	8.530	8.498	170	<.001
BEISP	122	64.81	11	55.55	9.266	3.979	131	<.001
BESFT	239	63.58	560	58.24	5.337	8.756	797	<.001
BMDS-P	71	57.38	102	58.84	-1.463			0.578*
BMUSC	2	64.00	2	61.50	2.500	.620	2	0.598
BN-ADP	18	71.33	13	57.15	14.179	3.624	29	0.001
BOCTH	38	66.95	43	56.70	10.250			<.001*
BOPT	61	58.98	58	55.29	3.691			0.017*
BS-CCT	51	55.35	30	57.50	-2.147	-.940	79	0.350

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	n	Mean				
BS-CHS	9	55.00	8	59.25	-4.250	-1.092	15	0.292
BS-ENS	172	52.98	171	58.41	-5.427	-6.027	341	<.001
BS-PD	24	61.38	43	56.28	5.096	1.999	65	0.089
BSAAPS	21	60.76	14	54.57	6.190	1.790	33	0.083
BSAPC	91	51.85	93	57.16	-5.315	-3.889	182	<.001
BSBLS	133	52.24	141	58.11	-5.866	-6.014	272	<.001
BSC-AB	4	54.75	5	54.40	.350	.066	7	0.949
BSC-AE	13	59.31	7	58.14	1.165	.263	18	0.795
BSC-AG	26	61.65	22	57.95	3.699	1.624	46	0.111
BSC-PS	4	62.25	7	58.86	3.393	.906	9	0.389
BSCA	55	46.31	32	59.03	-12.722	-6.556	85	<.001
BSCA	10	55.90	4	61.75	-5.850	-.850	12	0.412
BSCMB	75	48.89	76	58.14	-9.251	-6.676	149	<.001
BSCSIT	243	59.81	246	57.93	1.880	2.055	487	0.041
BSGLS	80	54.94	59	56.47	-1.537	-1.073	137	0.285
BSIAB	8	48.00	14	58.57	-10.571	-3.557	20	0.002
BSLES	698	52.51	608	57.57	-5.065	-9.671	1304	<.001
BSM	152	55.09	153	57.98	-2.888	-2.325	303	0.021
BSOWK	196	59.90	114	58.39	1.517	1.560	308	0.120
BSS	1678	57.47	1840	58.29	-.823	-2.700	3516	0.007
BSS4	118	55.03	83	59.08	-4.059	-3.090	199	0.002
BSSGBE	42	58.40	50	60.36	-1.955	-1.151	90	0.253
BSSGEM	488	56.03	461	57.62	-1.592			0.001*
BSSHSE	132	57.63	138	58.75	-1.125			0.814*
BTHEO3	6	57.33	5	66.00	-8.667	-1.221	9	0.253
ENG-AG	34	60.00	26	57.77	2.231	1.089	58	0.281
ENG-CE	18	56.44	29	58.55	-2.107	-.920	45	0.363
ENG-CH	81	57.74	116	58.11	-.371	-.358	195	0.720
ENG-CV	84	59.07	98	58.15	.918	.795	180	0.427
ENG-EC	27	53.19	57	58.11	-4.920	-2.681	82	0.009
ENG-EL	62	55.18	82	58.74	-3.566	-2.618	142	0.010
ENG-LS	13	61.62	26	59.31	2.308	.926	37	0.361
ENG-ME	79	61.34	104	58.49	2.851	2.364	181	0.019
LLB4	580	56.83	501	58.23	-1.406	-2.610	1079	0.008

In year 3 of the qualification, 22 groups of students doing the same course in 2020 performed significantly better, and 11 groups performed better. Eighteen groups of students performed significantly worse in 2020, and 21 groups performed worse than their peers from the preceding year.

Table 3d: Performance per qualification: Student level 4

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	n	Mean				
B-AUDI	37	65.76	32	57.13	8.632	4.629	67	<.001
B-NURS	94	64.01	85	57.81	6.199	4.633	177	<.001
B-PHAM	121	68.37	126	58.48	9.896	7.996	245	<.001
B-PHYS	48	67.46	69	57.13	10.328	5.682	115	<.001
B-SLP	44	57.41	59	57.53	-.116	-.067	101	0.943
BBSC	12	61.33	10	61.00	.333	.074	20	0.942
BCO4-A	12	52.67	1	57.00	-4.333	-.575	11	0.577
BCO4-G	44	51.20	16	57.00	-5.795	-1.791	58	0.078
BCOF-A	32	53.59	33	57.70	-4.103	-1.933	63	0.058
BCOF-G	184	54.42	194	57.70	-3.272	-3.809	376	<.001
BEECD	32	64.34	147	58.92	5.425	3.592	177	<.001
BEFET	819	61.11	885	58.64	2.466			<.001*
BEFIP	55	63.78	80	58.41	5.369	3.756	133	<.001
BEISP	137	62.86	146	57.21	5.656	5.266	281	<.001
BESFT	291	61.88	291	58.22	3.667			<.001*
BOCTH	38	68.24	47	58.17	10.067	6.634	83	<.001
BOPT	54	62.37	70	58.79	3.585	2.459	122	0.015
BSAAPS	2	59.00	5	69.20	-10.200	-1.818	5	0.456
BSC-AB	3	56.33	3	52.67	3.667	.612	4	0.574
BSC-AE	3	71.00	1	53.00	18.000	2.162	2	0.163
BSC-AG	2	52.50	5	66.40	-13.900	-2.229	5	0.076
BSC-PS	2	74.00	1	65.00	9.000	5.196	1	0.121
BSOWK	206	62.48	224	57.43	5.052	6.316	428	<.001
BSS4	16	55.75	9	55.78	-.028	-.008	23	0.994
ENG-AG	10	65.30	14	60.14	5.157	2.117	22	0.046
ENG-CE	32	60.78	28	58.25	2.531	1.409	58	0.164
ENG-CH	73	64.79	80	59.41	5.382	3.844	151	<.001
ENG-CV	86	62.70	120	56.12	6.581	4.980	204	<.001
ENG-EC	41	59.32	34	56.21	3.111	1.529	73	0.131

Qualification code	2019		2020		Mean difference	t	df	p
	n	Mean	n	Mean				
ENG-EL	56	60.41	87	58.06	2.353	1.629	141	0.105
ENG-LS	19	62.26	25	60.56	1.703	.602	42	0.550
ENG-ME	69	66.58	100	57.68	8.900	6.904	167	<.001
LLB4	641	57.87	681	58.76	-.895	-1.866	1320	0.062

In year 4, students generally performed significantly worse than their counterparts doing the same course in the preceding year (16 groups). In comparison, eight groups performed poorer, and eight groups performed slightly better in 2020. Only one group of students from the fourth year performed significantly better in 2020.

The question is: Does class size matter? To determine the effect of class size on the change in the average mark from 2019 to 2020, ANCOVA (analysis of covariance) was applied. This analysis used the 2020 mark as the dependent variable and the class size as the categorical independent variable. The 2019 mark was used as a covariate. It determined if there were any significant differences in the DV (2020 mark) across different class sizes, after controlling for the 2019 mark.

Class sizes were categorised as:

Category	Class size (students)
1	<50
2	50-100
3	>100

Figure 1 below shows patterns depicting comparisons of estimated average marks for 2020 against 2019 for undergraduate students at different levels of study.
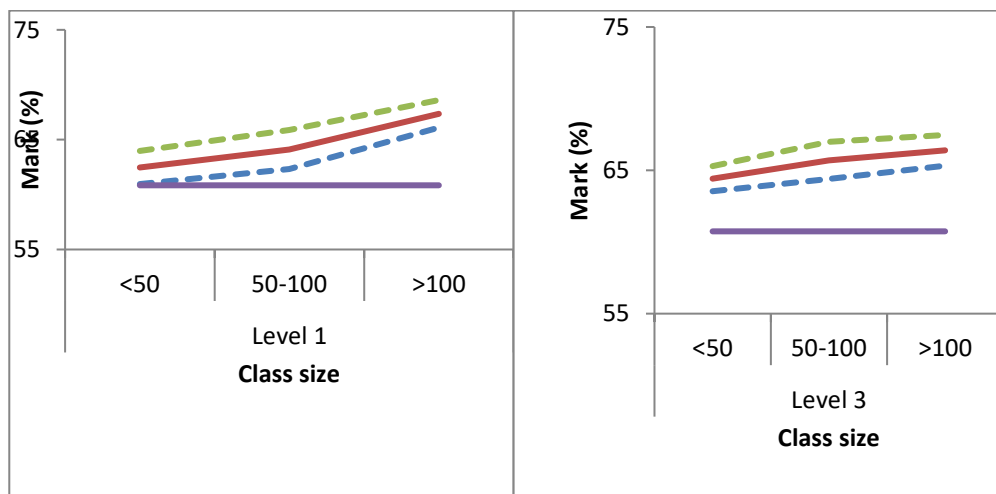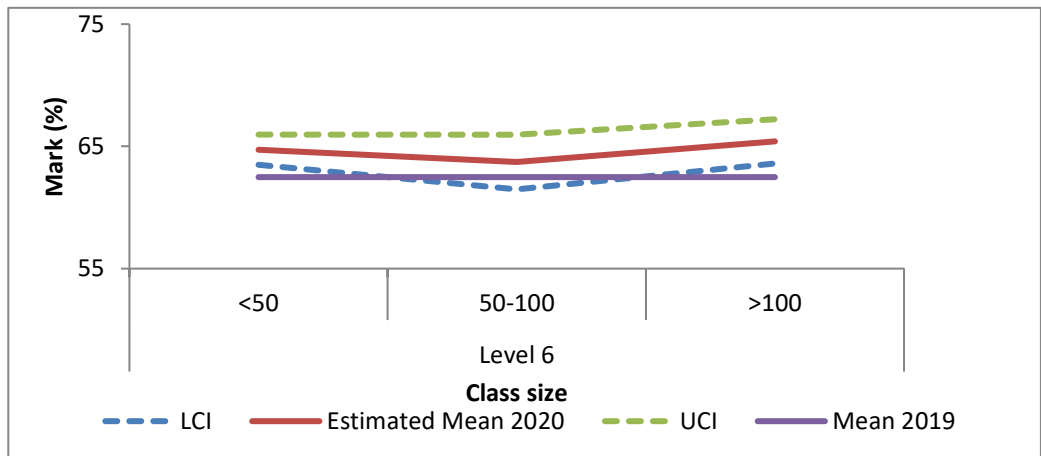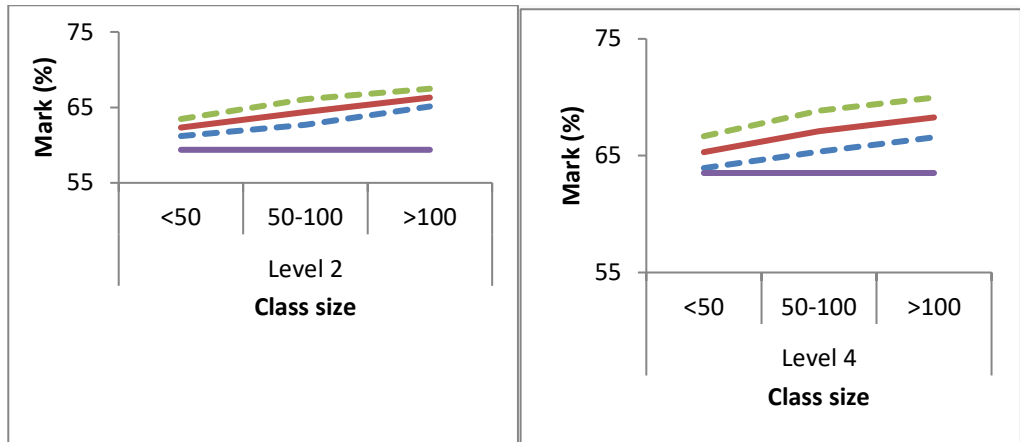
LCI= Lower limit of the confidence interval, UCL: Upper limit of the confidence interval

Figure 1: Comparison of the estimated means mark for 2020 with the mean mark of 2019 for undergraduate students at different levels

At level 1, Mark2020 is significantly higher for class size > 100 than for a class size <50 (p<.001) and class size 50-100 (p=.010). At level 2, Mark2020 is significantly higher for class size > 100 than for class size <50 (p=.001). At level 3, Mark2020 is significantly higher for class size >100 than for class size <50 (p=.020).

Discussion of Findings

The advent of the Covid-19 pandemic came with its own challenges and opportunities in the arena of teaching and learning as they were performed in emergency remote

conditions. These challenges and opportunities have the potential to open new vistas and pathways for teaching and learning as well as for assessments. The performance of students can be judged by their achievements. Wildschut et al. (2020) observe that predictors of student success commonly found in the literature include: student demographics, previous academic achievement; the environment; e-learning activities, and psychological factors. In this study, there is evidence suggesting that marks worsened from 2019 to 2020 across most defined variables. Students from study year 4 showed a significant plunge in marks. This finding is consistent with Wildschut et al. (2020), who observe that average performance at times plummets with an increase in the year of study. The plunge can be attributed to many factors, including complexities of material in advanced classes, stiffer competition in such classes, and specialisations that require special effort and attention—including challenges to transition to remote learning in a context of complexity.

Evidence also shows that females showed no improvement in study year 2 and significantly lower marks in study years 3 and 4. Covid-19 presented many challenges related to the shift to remote learning—new learning formats, adverse learning conditions at home affecting concentration—for females, this could mean taking additional care responsibilities as per local traditions and expectations, affecting mental health and well-being and ultimately academic achievement. Students from quintiles 1 to 5 showed worse marks in year 2, and students from quintile 5 schools showed slightly worse marks in years 2 and 3. Students from quintile 3 schools showed an improved mark in year 3, while students from all quintiles in year 4 showed significantly worse marks in 2020. The results are paradoxical because the expectation has always been that students from quintiles 4 and 5 performed better in most academic pursuits, which Ogbonnaya and Awuah (2019) ascribed to educated parents who take an interest in their children's success by providing additional educational resources and acting as mentors to them. This debunks the finding by Miller and Birch (Wildschut 2020) that the socio-economic status of the family strongly influences academic success. While socio-economic status matters in the context of South Africa in understanding academic achievement, it is clear that there were more factors at play during the Covid-19 pandemic than just socio-economic status. However, this reflection is necessary for invoking the necessary practice and policy measures to address the situation.

The historical inequalities and disadvantages endured by those students from lower-quintiles schools, still permeate into skewed performances at primary level and into the tertiary levels. The transmission of these performances is partially attributable to what Makombe (2021, 5) states, namely that students from disadvantaged communities are often affected by "power cuts, poor housing and limited internet connectivity", compounded by the absence of a conducive learning environment. Furthermore, as South Africa grapples with loadshedding, it is not only the disadvantaged communities that face the challenges of power cuts. While data for connectivity were provided to students during the early stages of the pandemic, poor infrastructure and lack of electricity exacerbated the challenges they faced with Emergency Remote Teaching

(ERT). For policy and practice, this implies that disruptions to these patterns can only take place through processes of deliberately and consistently elevating disadvantaged communities to levels of their counterparts in well-endowed communities by adequately provisioning them with ICT, human and related material resources. Our recommendation is that while parity may not be achieved in the short to medium term, arrangements can be made to twin advantaged and disadvantaged communities in proximity to share teaching and learning experiences.

The findings from this study show that self-funded and funded students performed significantly worse in study year 2, and both self-funded and funded students did not improve their marks in study year 3. Both categories of students had significantly lower mean scores in year 4. Naidoo and McKay (2018) observe that student achievement scores are not always a function of funding, although funding awarded on academic merit recorded the best results. They concluded that student funding is complex and nuanced, requiring careful observation and analysis and an appreciation of its complexity. This finding shows that while funding (and resources) is necessary to facilitate learning, there are new dynamics at play requiring more focused interventions, especially in circumstances of emergencies such as was presented by Covid-19. In other words, funding is a necessary, but not a sufficient condition to ensure excellence in studies.

There is a panoply of insights as those staying in residence did not post a statistically significant difference in the mean scores in year 2 as their marks remained the same or flat. In study year 3, students in on-campus residences had higher mean scores than their scores in 2019. Students in study year 4 had significantly lower mean scores in 2020—this could suggest the complexities inherent in advanced classes that were compounded by the challenges of the transition to remote learning. A study on places of residence as a factor influencing performance could unpack the ideal conditions for teaching and learning at these levels of study with a view to improving them.

Variegated results were posted by schools, with some schools (2282, 2284, 2384) reporting significantly worse scores at all academic levels in 2020, while one school (2483) reported significantly improved scores across all academic levels in 2020. Sixteen cohorts of students from the first year performed significantly worse than their fellow students doing the same course in 2019, and 16 groups performed worse than their fellow students in 2019 but not significantly. Only one group of students from the fourth year performed significantly better in 2020. This highlights the variegated impacts the transition had on student success attributable to a multiplicity of factors that require investigation per school and group or cohort. This has significant impacts on throughput and graduation rates.

In instances of overall improvement in mean marks across a range of variables, an in-depth evaluation is necessary. The university conducted most assessments using existing learning management systems that lacked proctoring abilities. The impact of

academic dishonesty and the effect of empathy by academics on the plight of students during the COVID-19 pandemic need investigation. The overall improved Performance, in spite of the challenges of student and staff readiness, technical ability, infrastructure and validity and reliability of assessment requires further evaluation (Guangul et al. 2020; Şenel and Senel 2021; Elzainy, Sadik and Abdulmonem 2020).

Plunging performance in some modules may necessitate the need to investigate the causal factors to such outcomes, given either the technicalities of the subjects or the difficult circumstances presented by the sudden switch to remote learning that overall encumbered performativity in teaching and learning for both staff and students. High-performing subjects hold the possibility to inform practice and the scholarship of teaching and learning. This includes learning about the tools and techniques, methods, approaches and methodologies of teaching and assessment which were used to obtain the results and outcomes.

The class size of greater than 100 on levels 1-3 showed significantly higher marks in 2020 than in 2019, compared to students in class sizes smaller than 50, or those in class sizes of 50-100. Students in a larger class would adapt more easily to online teaching, as they are not used to getting individual attention from the lecturer, as would be the case in a small class. Academic coordinators of modules adapted their assessment practices during the COVID-19 pandemic as conventional face-to-face assessment methods were replaced with online assessment practices. This may have been a factor in the improved results in 2020, compared to 2019. In face-to-face teaching and learning, there is evidence that suggests that smaller class sizes improve pedagogical and curricular quality (Stes, Coertjens and Van Petegem 2010). This is an area for further research to understand why large classes in circumstances of remote learning perform better than small classes do (where it is possible to pay individual attention to each student).

Conclusion

Contrary to the views about online assessments raised in the literature review section, the results show an overall drop in student marks over the period investigated. While this is a source of concern, the difficulties with online learning are very real in the context of the study as alluded to in the discussion section. Infrastructural issues, load shedding and connectivity issues which was exacerbated during the lockdown may have hindered students' performance. However, as things return to the new normal, it is clear that digital modes of learning have come to stay. To that extent, it is imperative to understand the worsened results to offer valuable insights to inform policy directions on online pedagogical and assessment practices.

A more detailed analysis revealed that the performance of females may have been hindered by the added responsibilities during the lockdown which affected mental well-being of many. While small class sizes are generally advocated, the analysis also

revealed that students in larger class sizes showed significantly higher improvements than smaller ones. This could be adduced to the ability of those in the larger classes to adapt easily to online learning. Further contradictions emerged from the analysis by quintiles as marks of students from higher quintiles (4 and 5) worsened slightly in 2020 probably due to the complexities associated with pandemic induced Emergency Remote Learning (ERL). Given these results and the socioeconomic background of bulk of the student cohort, epistemological access could have been limited for some of them due to the digital divide that characterised learning in the pandemic era (Du Preez and Le Grange 2020). Hence the need for a qualitative understanding of the reasons behind the marks which the larger project aims to achieve from planned focus group interviews with academics. It is envisaged that the project outcome will support a hybrid assessment strategy that strengthens the online pedagogy and caters to students' contextual demands.

Limitations

The assessments administered in 2019 were not exactly the same as those of 2020 because of the lockdown conditions (Mafugu, 2021). In 2019, many undergraduate students wrote examinations at the end of the semester and had sessions that constituted a significant proportion of the year mark. In 2020, continuous assessments were advocated, with many modules concluded without written examinations. However, this comparative analysis set out to ascertain the impact of online assessments on overall student results, which was accomplished as intended. The study is further limited in the specificity of application by being case based. Cognisant of this, the study was designed to afford replication by interested scholars, and learning from it will be useful to academics globally, especially those in the developing world context. In addition, even though the investigation revealed the improved outcomes on a year-on-year basis, the reasons behind the results remain unknown, which is typical of quantitative analysis. An in-depth, qualitative analysis will be conducted at a later stage of the study to provide a holistic understanding of the online assessment practices adopted by academics at the institution.

Future Research

The future qualitative component of this study includes conducting interviews with selected academics at the selected institution through Focus-Group Discussions (FGD) and individual in-depth interviews to explore the possible reasons for any difference in the results across the two years. Data will be analysed using a thematic approach after the FGDs.

Additionally, desktop analyses of actual assessment tasks used by academics will be adopted to establish the consonance between what academics discuss about their assessments during the FGDs and what the actual assessments reveal.

The themes identified in the qualitative analyses will be used to design a quantitative survey instrument aimed at targeting a broader range of academics to establish the frequency of the attitudes, behaviours and practices, including soliciting for their knowledge, attitudes, and perceptions regarding online teaching and assessment.

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