



Student Voices

Challenges and Preferences with Technology-enabled Online Teaching and Learning in Higher Education

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June 2024

Keywords

Student voices, online teaching, technology-enabled learning, technology in higher education, access with success

Abstract

The adaptation of the curriculum to incorporate cutting-edge technologies and human ethical values necessitates a careful, deliberate approach. A technological transition, pivotal for the future of education, is fraught with challenges but also with real chances for better human self-understanding. To appropriately understand the complexities and significance of this digital shift, *Stadio Higher Education* conducted a survey (STADIO SV Survey) to capture the voices of students on technology relevant to their social, learning, and teaching environments. After consolidating fundamental points as the methodology and the reliability of the survey, we proposed a descriptive analysis and a substantial study of the findings provided. Literature review and discussion of such important concepts as: choice of the technology, the nature of access, the computing skills needed, communication, contact and successful engagement permit, in a nutshell, the articulation of some very useful closing recommendations.

Corresponding Author: Divya Singh, Stadio, DivyaS@stadio.ac.za To quote this article: Singh, Divya. 2024. "Students Voice: Challenges and Preferences with Technology-enabled Online Teaching and Learning in Higher Education". *Journal of Ethics in Higher Education* 4(2024): 27–59. DOI: 10.26034/fr.jehe.2024.5961 © the Author. CC BY-NC-SA 4.0. Visit <https://www.jehe.globethics.net>

1. Background

Globally, the number of higher education institutions offering online teaching and learning as the norm and the concomitant positive uptake by students has seen remarkable and accelerated growth in the period post the COVID pandemic. As higher education in South Africa embraces the new technologies in its commitment to, amongst others twenty-first century curriculum relevance, it needs to be assured that its decisions are informed and responsible and that it does not fall foul of the promise in the White Paper on Higher Education (DHET South Africa 1997) *to leave no student behind*. South Africa is a country of great inequality, and the prevalent technology disparity is symptomatic of the socio-economic reality. Therefore, while acknowledging the incredible opportunities created by technology, there is a caution for higher education that always bears consideration.

In pursuit of its programme of informed curriculum reform and transformation, STADIO Higher Education (the Institution) conducted a survey to capture the voices of students on technology relevant to their social, learning and teaching environments (the STADIO SV Survey). The aim of the research was to investigate opinions of students on various facets of technology-enabled learning and particularly their views on online learning, its accessibility and efficacy.

The importance of student voices is being increasingly accepted in the higher education milieu for the significant role that it can play in student success. The research by Stefl-Mabry et al (2010:66) reminds us pertinently that:

“ By the late 1990s and the early part of the 21st century the term student voice began to emerge in the dialogue of educational research and reform, suggesting a cultural shift, not only to listen to students, but also to legitimize students’ perspectives and opinion and argue for its inclusion in discourse related to educational practice and school reform.

Affirming the value of students as critical stakeholders in shaping teaching and learning, Byker et al (2017:119) describe student voices as the term “[honouring] the participatory roles that students have when they enter learning spaces like classrooms.”

There is no gainsaying the pervasive realities of technology in the 21st century and STADIO’s mission is to ensure that its graduates are suitably prepared for the new world of work. The student voice (SV) study is thus a valid means to understand students’ contexts, their challenges, and their preferences, and enable the Institution to identify appropriate technology norms and 21st century pedagogical approaches to teaching and learning that will enhance learning, while simultaneously preparing students for the challenges and demands of a technology-based working milieu.

2. Research Methodology

A quantitative self-administrated research design was used to collect information from the data subjects (STADIO students), and the study received the necessary ethics clearances. The survey tool was transformed into an electronic format to enable a web-based self-completion approach. An email invitation was sent to all students and participation was clearly indicated as voluntary, confidential, and anonymous. The online survey period for the study was the last two weeks of August 2023. The data was downloaded, cleaned, and stored for analysis purposes. This paper presents the descriptive analysis of the outcomes of the student voices survey.

3. Reliability and assessment instrument

The reliability of the data obtained by means of the student self-assessment instrument on technology in teaching and learning was computed by using the Cronbach Alpha reliability statistics in the Statistical Package for the Social Sciences (SPSS). The Cronbach Alpha coefficient provides an indication of the consistency of the data obtained by means of the survey instrument. Cronbach Alpha values range between 0 and 1 and are a measure of internal consistency based on the average inter-item correlation. The quantitative data sets of the STADIO self-assessment student voice survey with seven research constructs and 64 research items returned an overall Cronbach Alpha statistic of 0.850, reflecting a highly reliable result (see Table below). This test result confirms the highly satisfactory reliability of the data resulting from the student self-assessment model, which was

designed to measure technology access, use, satisfaction, challenges, preferences, likes and dislikes, and skills of STADIO students.

Table 1: Cronbach Alpha Reliability of Assessment Instrument

Research construct	No. of Items	Alpha
Technology access	14	0.607
Technology use for social and learning purposes	4	0.721
Technology expectations and experiences	7	0.710
Technology challenges/barriers	14	0.935
Technology preferences	5	0.554
Technology likes and dislikes	14	0.865
Technology skills self-assessment	6	0.817
Overall	64	0.850

4. Descriptive analysis

The research findings are presented according to the main themes covered in the survey. Prior to the analyses, a demographic profile of the student population is shared, which serves to contextualise the outcomes of the study. The analysis also includes a cohort analysis that compares the results of the contact learning students (most of whom are young school leavers) and distance learning students (the majority of whom are mature adult learners). Of the 1805 respondents, 587 (32.50%) were contact learners and 1218 (67.50%) distance learners.

5. Research Findings

STADIO offers both the contact learning (CL) and distance learning (DL) modes of delivery and the teaching and learning models in respect of both modes of delivery are clearly established. However, to better understand the survey findings, discussion, and recommendations, it is important to understand the teaching and learning models in place for CL and DL at the time when the survey was conducted. STADIO's contact learning and teaching model is a blended model including venue-based classes (minimum 50% per programme), synchronous online classes (minimum 25% per programme), and asynchronous online activities (minimum 25% per programme). The distance learning model of learning and teaching has taken

cognizance of the student profile and the students being served and is intentionally not an online delivery model: rather, STADIO retains the fundamentals of distance learning enabled by technology that further supports students to bridge the spatial divide between effective learning and teaching.

The evolution of distance learning has been a journey from pure passive engagement (sometimes described as correspondence learning) to a more engaged pedagogy of co-created knowledge between lecturer and student. Describing the timeline, Van den Bergh (2020: 3) points to the latter part of the twentieth century and early twenty-first century when social constructivist pedagogy around distance learning began blurring boundaries between the older style correspondence distance learning and face-to-face models which he describes as *cognitive behaviourism*. Today, online learning has built on the model of constructivism and is also presented as a pedagogy of connectivism with the student at the centre of the learning. Van den Bergh (2020: 6) provides a pithy tabular summary of the evolution from passive distance learning to the online, engaged connectivist model of delivery which is repeated below.

Generation	Technologies	Student Activity	Content	Assessment	Lecturer Role
Cognitive Behaviourism	Print, TV, radio, one-on-one communication, no dependence on the internet	Read and watch, student-lecturer	Pre-packaged materials designed by lecturers	Mainly recall, written assignments and examinations	Content creator, sage-on-the-stage, little interactivity
Constructivism	Video-conferencing, many-to-many communication, internet, email, skype, mobile devices	Discuss, create, construct, student-student, student-lecturer	Lecturer designed materials, discussions	Essays, applications, discussions, summaries	Discussion leader, guide on the side
Connectivism	Web 2.0 social networks, combination of systems, internet	Explore, connect, create and evaluate, student-content	Self-created materials	Creation of documents, applications, artefacts	Critical friend, co-traveller

A brief summary of the three generations of DE according to evolving pedagogies. Based on the work of Anderson and Dron (2011).

Acknowledging the technology constraints experienced by current and prospective students, students continue to receive printed study materials which are duplicated on the institution's learning management system, Canvas. However, there are three compulsory classes as well as other scheduled (voluntary) online classes, weekly online consultation sessions, an online Q & A Forum hosted by the lecturers, online formative assessments, and all assessments are submitted via the online portal. The greyed blocks in Van den Bergh's tabulated summary(above) reflect STADIO's current position on distance learning. The teaching and learning model adopted by STADIO finds resonance with the advice of Queiros and De Villiers (2023: 179) who stress that:

“ In the context of developing countries... institutions should note that the newest technology is not necessarily optimal, but should rather consider a critically discerning hybrid of appropriate, user-friendly, and accessible technology combined with media such as print and radio.

Student demographics

The respondent sample - 1805 students in total - included students registered for qualifications ranging from Higher Certificates to Doctorates. Most of the students (57.6%) who participated in the SV survey were registered for degree studies and an overall 88.5% were registered for undergraduate programmes, including degree studies. About one-third (32.5%) of the students were contact learners (CL) and 67.5% distance learners (DL). 84% of the DL students were adult learners. About a fifth (19.10%) of the respondents were younger than 22 years of age, and most (55.4%) were between 22 and 39 years of age. 85.4% of the sample described themselves as resident in urban or semi-urban areas.

Overall, the demographic data displayed a good spread of the STADIO student population across all cohorts explored in the SV survey, allowing for an overall understanding of students' capabilities for learning using technology, as well as a more specific comparative cohort analysis for CL and DL students. The representative samples across cohorts enables the institution

to develop a more nuanced and segmented improvement strategy and plan to enhance the future technology experience and teaching and learning approaches at STADIO.

Access to technology

Most students (80%+) indicated that they had access to the internet (87.3%), a smartphone (95.6%), a laptop computer (92.2%), connectivity (85.2%), and data (80.8%) which enabled them to study online. The student ratings for overall access to technology *for online learning* ranged between *average to good*, and 42.3% of the respondents rated their overall access to technology for learning as *very good to excellent*. The contact learning students rated their overall access to technology for online learning slightly higher when compared to the distance learning students. The use of technology tools for purposes of online learning was quite positive supporting the statement that students did not have difficulties accessing technology tools for learning.

Table 2: Use of technology tools

Technology tools	Frequency	Percentage
Laptop Computer	Once a week	12.12%
	Once a day	22.36%
	<i>More than once a day</i>	<i>59.61%</i>
Smartphone	Once a week	4.88%
	Once a day	12.26%
	<i>More than once a day</i>	<i>79.46%</i>
Tablet	Once a week	13.93%
	Once a day	16.39%
	<i>More than once a day</i>	<i>51.91%</i>

Laptops and Smartphones appear to be the preferred instrument for learning with the Smartphone being used more regularly daily.

The Table below summarises the key resources that students used on a regular basis to support their learning journey.

Table 3: *Use of Technology Resources*

Technology tools	Frequency	Percentage
Virtual Learning Environment (CANVAS)	Once a week	14.26%
	Once a day	24.07%
	<i>More than once a day</i>	<i>56.12%</i>
Social Networks (i.e. wikis, blogs, Twitter, Facebook)	Once a week	9.55%
	Once a day	22.15%
	<i>More than once a day</i>	<i>62.35%</i>
WhatsApp	Once a week	2.34%
	Once a day	8.62%
	<i>More than once a day</i>	<i>87.20%</i>
Teams/Zoom	Less than once a month	10.59%
	Once a month	17.02%
	Once a week	41.24%
	Once a day	15.04%
	<i>More than once a day</i>	<i>16.10%</i>

An immediate concern from the Table above is the Teams/Zoom participation rate. Bearing in mind the Institution's teaching model which includes weekly online consultation sessions for DL and synchronous online classes for CL students, it is apparent that a significant number of students are not participating in these activities.

Technology use and competence for learning purposes

Students were asked to compare their technology use and competence for learning purposes through a comparison with their use and competence of technology for social purposes. 72.6% of the respondents rated their competence with technology for learning between good and excellent and an additional 24.8% described their ability as average. Interestingly and surprisingly, this was very similar to students' rating of their competence with technology for social purposes which they rated as 71.7% good to excellent, and 25.9% average. 72.5% of students indicated that they were frequent users of technology for social purposes, while a much higher number of students (84.6%) responded that they frequently used technology for learning. The self-assessed technology competence levels of contact learning students were only slightly higher than their distance learning counterparts.

Table 4: *Technology competence for social and learning purposes – CL and DL students*

Index	Contact Learning	Distance Learning
Technology competence for social purposes	80.40%	78.60%
Technology competence for learning	79.60%	77.80%

The importance of technology as a key graduate attribute and competence appeared to be clearly understood. 81.30% of the students either “agreed” or “strongly agreed” with the statement that higher education institutions should use technology for teaching and learning and a further 13.80% “slightly agreed”. The results confirm the sentiments expressed by Allen (2018: 18) that “today’s students need and want to learn with technology.”

Technology expectations and experiences – STADIO Systems and platforms

Having ascertained students more general views on technology for teaching and learning, the study focused specifically on the ease with which students were able to navigate the three key technology platforms adopted by the Institution. Regarding the learning management system (CANVAS), 63.10% of students identified it as easy/very easy to use with a further 21.80% describing its user-friendliness as “average”. More than 100 students (5.60%) stated that they experienced CANVAS as “difficult” or “very difficult” to use. The respondent feedback on Turnitin was more disconcerting with only 51.90% of students indicating ease of use, 23.00% of students stating that usability was of “average” ease, and 5.60% of students describing it as “difficult” or “very difficult”. Critical under this category was the fact that 18.50% of students recorded that they had not used Turnitin. Based on previous data, this is less likely to be because students did not have access to technology and more possibly because students found it difficult and made use of the interim arrangement allowing them to email their assessments to the Institution.

The third platform to be surveyed was the online library. Only 34% of the students surveyed confirmed that it was “easy” or very easy”, 30.70% of

students described it as being of average ease to use, and 17.2% of the respondent sample stated that the online library was either “difficult” or “very difficult” to use. 18.10% of the respondents stated that they had “given up” and never used the online library resources for learning purposes.

Against this backdrop, students who responded to the survey were highly satisfied with online learning at STADIO (Satisfaction Index = 79.33 points). The contact learning students were slightly more satisfied (79.83%) than their distance learning counterparts (78.17%).

In addition to the survey questions, students were also given an opportunity to present open-ended feedback on significant areas of satisfaction and dissatisfaction with the online technology-led teaching and learning model at STADIO. 213 students responded highlighting their challenges, and 1081 positive qualitative responses were received from the student sample, supporting the high satisfaction index indicated earlier.

The challenges raised by the students were analysed and may be categorized from the institutional perspective as follows: exogenous factors including factors beyond and within the students’ control, and endogenous factors attributed to STADIO. The extrinsic challenges linked to limited bandwidth, connectivity constraints, data limitations and unstable networks constituted more than half of the reasons for students being significantly dissatisfied with online teaching and learning.

When connectivity is bad, we miss out on some or most part of the content being discussed.

Students residing in the rural areas experienced access to technology as a much greater limitation than their urban and semi-urban counterparts.

There are areas of disadvantaged internet access and coverage in SA and internet access for studying remains challenging.

In the rural areas, there are problems with network coverage most of the time.

We have very bad network coverage in the rural areas which makes us miss most of the online classes.

The cost of data was also a consistent challenge for students. One student noted, “... it is on top of the fees that we paid for live learning.” Another student stated:

I am putting myself through school and sometimes I don't have data, and then when I do have data sometimes the network is not on my side.

The debilitating effect on learning was summed up in the following student comment:

Sometimes there is questions that I don't understand and is no-one I can ask and I don't have data or wi-fi to ask online at that moment when the classes are scheduled. Then you will struggle until the end of the month when you can afford to buy some data.

The second substantial challenge recorded was loadshedding and the electricity outages.

Due to loadshedding, laptops and phones becoming flat while still online. That disturbs studies.

There are times where classes are scheduled during loadshedding meaning that we miss out on the lectures.

Several responses linked to technological constraints can, however, also be attributed to the students' own capabilities and capacities for using technology. This warrants further investigation by the institution as an explicit requirement of admission is that all students have access to the necessary technology to support their learning journey. Many of the responses noted:

I don't have enough data to study online.

Data is too expensive.

Internet access remains challenging.

I don't have internet at home.

I do not have wifi and can't access Canvas on a daily basis which makes it hard for us to be on track with others and it puts us under really hard expenses.

The third area of major dissatisfaction with online learning was intrinsic to the Institution and specifically connected to how the teaching staff used the technology platforms for teaching and learning. The most prevalent issue related to the setup and population of the learning management system (Canvas). The students' key challenges were that information was (a) inconsistently placed on the LMS and (b) sometimes not placed and/or did not work for example, "The hyperlinks cannot be accessed." Another student responded:

As it is a challenge already to use the laptop now to figure out where things are as they are found differently on each module.

More critically, students pointed out:

It is also obvious that lecturers have a hard time using it [Canvas] because nothing is in the same place and sometimes there are due dates for empty assessments.... [T]his causes so much panic amongst students.

The lecturers themselves come off as if they don't know how to use the platforms especially Canvas! It becomes difficult studying, dates and materials sometimes tend not to show, it's all a mess and all confusing.

Based on the feedback received, it is apparent that staff development and capacity-building are needed to improve online teaching and build an experience that focuses on enhancing the students' learning experience. For example, students noted that lecturers in the online classes had their cameras turned off for the duration of the class; and/or appeared not to be cognisant of the time required for students to effectively engage with the information presented. Respondents shared:

Before you can type out your response, the lecturer has moved on.

[Online learning is] extremely disengaging, lecturers do not give you time to type out your response.

During online sessions, no time is allocated for student engagement and questions.

Lastly, under areas of dissatisfaction with online learning and teaching was communication and students were outspoken in their dissatisfaction. Summing up the sentiment, one respondent wrote, “Lecturers take a long time to respond. Sometimes we have to wait up to 4 days to get an answer.”

Students were asked to rank the top three technological challenges experienced with online learning and the results were as follows:

Table 5: Technology challenges with online learning

Challenges	Index
Availability/Stability of electricity	100.00
Cost of data	93.48
Limited connectivity	52.25
Affordability of devices	29.66
Data security	20.52
Difficult to use	17.61
Proper digital devices	15.51
Limited access to a computer	13.56
No device	3.13

Index values closer to 100 display more serious challenge.

The top three technology challenges faced by students relate to exogenous factors and include the availability/stability of electricity (loadshedding), cost of data, and limited connectivity. On average, students spend about R2 040.00 per annum on technology resources to support their online learning, the majority of which is data, with distance learners annually spending about 3% more than contact learners. 17.20% (252 students) indicated that they spend between R5 001.00 and R10 000 on technology resources and tools annually and 125 students (8.50%) noted that they spent more than R10 000.00 annually.

On the other hand, a significant majority of the survey respondents were very satisfied with their online learning and teaching experience. There was overwhelming acknowledgement for the “convenience” and “flexibility” of

online learning and the fact that it allowed them to study “anytime, anywhere” and “at own pace”.

I can also meet my lecturer while in my house than driving long kilometers to venue-based classes.

The fact that the LMS is mobile-friendly was a further reason for many students being able to access and engage with online classes.

It is accessible from anywhere provided you have a laptop, internet, or a smartphone.

The recorded lessons that are part of the learning and teaching model “allowed students the ability to redo material”, “review lessons”, and they “created opportunities for reflection”. Noteworthy was the number of respondents who appreciated the technology and the online classes as it encouraged them to plan their studies more effectively and kept them focused.

It makes me focus more on the modules because I am always online active.

The online classes were also commended for limiting the isolation that often characterizes distance learning and allowing distance learning students to “feel part of a community.”

The online classes allow distance learning students to network and make new contacts – we meet new people daily by using technology.

Contrary to the Canvas challenges highlighted by a selection of respondents, more students described Canvas and the concomitant student support as areas of “major satisfaction”.

Canvas and student support are my major reasons for satisfaction with my studies. Since the educators have clearly prioritized the organization of the Canvas site, it has made studying and assignment submission much easier since I never have to worry, guess, or search for due dates or assignment information and if ever I needed to ask my lecturer a question, I was able to contact them. I don't necessarily get a reply instantly but if I give the lecturer

ample time to reply and when I manage my studies and time as I should, I don't have any problem with the time it takes to reply.

Canvas is an easy platform to use for distance learning, and therefore communication is very good.

Canvas makes everything easier for distance learning, so satisfying.

Canvas is an exceptional study tool, I like its layout, it's not very hard to navigate, but it does take some getting used to.

Perhaps summing up the challenges and opportunities of online learning were the following student comments:

It is easier and convenient to access information, interact with each other, receive study materials or access recordings for missed lectures. It is not perfect in terms of unforeseen challenges we might encounter due to network or unexpected technological glitches.

Also,

For students still learning the computer, Canvas is not easy to navigate. You need to know something about computers to use Canvas successfully.

At first it was a bit difficult to get used to the fact of using technology as a way to education mostly given that in my high school, we only used paper but after learning how to use it [the technology], it has made learning more fun and interesting.

The student assessments of the fundamental challenge with Canvas and in tandem online learning finds resonance in the data drawn from the survey section: *Technology skills self-assessment*. The percentage of students with, at least, *good computer skills* dropped from 85% for students with basic skills to 63% and 43% of students with intermediate and advanced computer skills. However, overall, 75% of the respondents were confident that they had good enough skills to work with Canvas as a learning management system. Notwithstanding, about seven in every ten students (69.80% of survey respondents) still supported the statement that all qualifications should include a module on *understanding technology for learning online*.

Technology preferences

Table 6: *Technology choices to support learning*

Technology		Percentage
Additional digital resources (i.e. recordings, snippets)	Definitely not	2.20%
	Probably not	2.40%
	Possibly	10.90%
	Probably	15.80%
	<i>Definitely</i>	<i>68.80%</i>
Virtual learning environment	Definitely not	2.30%
	Probably not	2.90%
	Possibly	14.50%
	Probably	16.70%
	<i>Definitely</i>	<i>63.70%</i>
Online classes	Definitely not	3.60%
	Probably not	4.10%
	Possibly	15.00%
	Probably	13.80%
	<i>Definitely</i>	<i>63.50%</i>

In response to the question on information sources, students had a much higher preference for online search engines (e.g, Google and Bing), followed by the online STADIO library (a distant second), and open-source artificial intelligence chatbots. This correlates with the previous finding that students find the online library platform difficult to navigate.

Technology relevance to the world of work

There is no gainsaying the currency of the fourth industrial revolution (4IR) and this was reflected in the respondent feedback. Most students (85%+) agree that technology is a critical skill for a chosen career in the 21st century.

Table 7: *Technology is a critical skill for your chosen career in the 21st century*

	Percentage
Totally disagree	4.50%
Disagree	1.80%
Neither agree/disagree	6.50%
Agree	27.70%
Totally agree	59.50%

Confirming the data in Table 7, student sentiments in the qualitative section describing their satisfaction with technology-led learning and teaching included:

We are in the fourth industrial revolution and every higher education institution must go with the times.

Given their engagement with the world of work, distance learning students were asked a question on how *your technology experience with learning improved your work capabilities*. Their responses were again more positive and are set out in Table 8 below:

Table 8: *How technology experience with learning improved work capabilities*

	Percentage
Poor	1.60%
Minimal	5.70%
Sufficient	18.30%
Above average	35.50%
Excellent	38.90%

About 75% of the distance learning students agreed that technology experience with learning had an above average or excellent impact on their work capabilities.

I have learned a lot through my online studying. I am learning every day as I discover more things about technology that I did not know before.

Comparative sampling between the school-leaver and adult learner sub-samples in distance learning

Whereas the analyses up to this point presented some comparative information between contact and distance learning students as part of the overall study findings, some salient findings between the opinions of the *school-leaver* and *adult learner* sub-samples in the distance learner category of students are also pertinent for purposes of this study especially with an emerging trend of school leavers increasingly registering for distance learning.

Unsurprisingly, school leavers were more avid users of smartphones and internet technology and used technology for learning more frequently than their adult learning counterparts and found the teaching and learning technologies easier to use than the adult DL learner. In similar vein, the school leaver sub-sample was much keener about expanding the tech spectrum and using other technologies like webcams, cloud computing, social networks and Teams/Zoom for learning and teaching. The school-leaver group was also more inclined to use online search engines (e.g, Google and Bing) and open-source artificial intelligence chatbots for research and assessments, whereas the adult DL learners favoured the STADIO online library as a key source of information. Insofar as communication and messaging, 70% of the adult learner sub-sample use sms-es daily while only 4 in every 10 school-leavers indicated a regular use of sms messaging.

Adult learners agreed more than the DL school-leaver sub-sample that higher education institutions *should use technology for teaching and learning*. This finding may be explained by the fact that limited connectivity and affordability of data and devices were bigger challenges among school-leaver students than adult learners.

6. Literature review and discussion

In 2023 Atherton (October 7: n.p.) noted that the global trend reflected a regression in terms of access to tertiary education for all students and especially those from low-income and other disadvantaged backgrounds. This is not the South African reality because of several national imperatives and policy directives (Agumba et al 2023). However, what is of significant concern in South Africa is that while access may have improved, socio-economic disparities, and the legacies of apartheid between rural and urban communities prevails with material impact for academic success. In the current period in South Africa:

“ ... many students continue to be disadvantaged by virtue of their identities and economic, social, and geographic backgrounds as most initiatives fail to address the deeply entrenched

and systemic inequalities that affect students from rural backgrounds (Agumba et al 2023:23).

While technically, notions of rural and urban configurations are primarily spatial disciplines, student geography in South Africa - that is, where students live - has been identified as having a direct correlation on access and success (Agumba et al 2023). Rural segmentation highlights a confluence of barriers for students including race and social class, which cannot be ignored when institutions admit students for teaching and learning. Confirming this important consideration as a factor of student admissions, Moodley et al (2023) emphasise the myriad of diverse factors influencing success, which need to be engaged and managed holistically when institutions deliberate on student success.

Choices of technology, access, and computing skills

Specifically discussing the factors of (i) technology choice, (ii) technology access, and (iii) computing skills, Agumba et al (2023:37) make a pointed reference to the “foreignness of technology” for many students and stress it as one of the key barriers to academic success for students especially from rural geographies. Their study confirms the findings in the STADIO SV Survey regarding the use of and access to technology. Agumba et al (2023) highlight specifically the broader realities with which students from rural backgrounds must grapple reflecting on the academic environment, which can also be alien and, for many, a hostile one; academic language, concepts, work demands; and structures that are unfamiliar. Van den Bergh (2020:8) includes, in this milieu, the importance of a conducive studying environment citing from his research the following student experience:

“ I have been struggling with everything, mostly because in my home I don’t have electricity. Added to this is a poor network connection. Consequently, I wrote one of my exams at a mountain which is 3km away from my home. I am frustrated as I am unable to afford to rent a place in town where I can get access to electricity and a good network connection. Recently, I had to write my examination late as the network connection was slow.

It is a complex dynamic that students from rural environments must navigate - and overcome - to fit in with institutional teaching and learning norms but, caution Moloi and Salawu^a (n.d.), it would be entirely remiss to conclude that students with rural origin are intellectually incapable of using modern technologies. Key from this discussion is rather to understand that while lecturers remain unaware of the profile and realities of their students, there is only a limited possibility of successfully bridging the gap for affected students.

For many students, online learning is enabled using a mobile device. On the positive side, mobile devices are more affordable, most students already have one, and they provide students with some access to their learning content. However, mobile devices for learning are not without their challenges. One of the biggest limitations experienced by students is reading lengthy library texts on a mobile device. Equally, engagement in writing programmes cannot be successfully done on a mobile device (Moloi and Salawu^a n.d.: 19). Thirdly, the compatibility of mobile devices has also been raised as a concern.

“ ... the academic leaders through the interview emphasized that not all mobile the phones in possession of the students are android, which aggravates the perceived inequality among the student’s populace. Accordingly, this was linked to the potential result in unequal access to technology opportunities/digital divide among those students who can afford it and those who cannot afford it (Moloi and Salawu n.d.:19).

In the STADIO SV Survey, too, students noted the difficulty of learning using a mobile device, and the added limitations linked to the type of mobile device. For example, it was stated:

It’s difficult to connect online especially my phone says not compatible when I try to connect, and I cannot afford a smartphone.

Focusing on South African experiences, Bharuthram and Kies (2012) highlight limited access to computers, high costs of computing, and internet access as being amongst the main barriers facing students on online learning programmes. Corroborating earlier findings on the impact of lack of access

to technology, they reflect on the impact of such limitations which leave students feeling marginalized and anxious and contribute to widening the digital divide between them and students with access. On the other hand, confirm Queiros and De Villers (2016: 175), students who could use a computer and the internet with ease, felt much more positive and engrossed with their studies, more motivated, and more prepared to engage with technologies. In this regard, Mayes et al (2011) remind us that the instructional value of any technology is only as good as (a) the quality of its implementation and (b) the skill and comfort levels of the beneficiaries/users. One without the other will hamper the learning experience. The STADIO SV Survey confirms the earlier findings of Wang et al (2013: 305) who reported on the increased technology self-efficacy and course satisfaction amongst students with previous online experiences. This was also confirmed by D’Angelo.

“ When students perceive that the attributes of a given technology are engaging and beneficial to their learning, they are likely to adopt that technology and use it to enhance their understanding of the course content. (D’Angelo 2018: 3)

Looking specifically at the distance learning respondents in the STADIO SV Survey, the results indicated clearly that school-leaver respondents (compared with their mature adult counterparts) (i) were more versed in the use of technology and (ii) were also keener to try new and innovative technologies as part of the earning experience. Wang et al (2023: 314) attribute this to their ability to develop more effective learning strategies building on previous experience of technology. Novice learners on the other hand are often confused, resulting in anxiety and a loss of control (Mayes et al: 2011).

This is an important consideration considering the findings by Moloi and Salawu^a (n.d.:30) who record that only 13% of the Executive Deans (in their study across 22 of the 26 national public universities) believed that students had access to sufficient technology - connectivity (wi-fi) and data - to progress with their learning. Most believed that as soon as students left the campus their ability to engage meaningfully with their studies was drastically reduced.

“The extreme cases (about 20%),” they note, “occurred where the students do not have personal devices and/or reside in remote locations ... where electricity and internet access were not consistent.” Queiros and De Villiers (2016: 175) report that 58% of their respondents only have access to a computer at the office. The STADIO Student Voice Survey also identified several respondents who while they had access to devices, only did “not have internet at home” and could only access the internet at work. The effect then is that in both instances students are not able to engage effectively with any kind of online teaching and learning.

Discussing other technologies favoured by students for learning, the study by Queiros and De Villiers (2016:170) revealed only “tentative positivity on video clips (47-56%)” which result the authors themselves describe as “surprising”. They note that students were more positive about websites as learning tools leading them to suggest that the attraction of the web was that it directed the students to more independent seeking of information, while videos are a more passive experience. One student in the study summed up the finding responding that “... with web browsing you get a wider view of matters, and you can make up your own mind.” On the other hand, Scagnoli et al (2017:3) are more affirming about the use of video as a teaching tool and specifically its value in student engagement as it gives the user far more control of the media. In similar vein, Tse et al (2017) and Moloji and Salawu (2022: 207) agree that video-based flipped classroom instruction enhanced both teaching effectiveness and subject satisfaction in students. In the STADIO SV Survey, students appeared to favour videos when new concepts were being explained: however, the web was preferred when learning was focused on acquiring new knowledge.

Communication, contact, and engagement

From the available literature, there is overwhelming agreement that in online learning, the quality of the learning experience is significantly proportional to the reciprocity of engagements and communication, and promptness of responses and feedback to student enquiries (Ilgaz and Gulbahar, 2015). In the study by Queiros and De Villiers (2016) extremely high ratings went to lecturer interaction. It was therefore not surprising that in the institutional

STADIO SV Survey almost 11% of respondents who indicated a dissatisfaction with online learning, raised specific challenges of poor or no communication and engagement from lecturers.

Constructive and active engagement from the lecturer builds the sense of community, concomitantly minimizing the sense of isolation which is one of the well-recognised risks of distance learning. The knowledge that there will be a response and timely feedback from the lecturer fosters a sense of belonging, builds confidence, and reduces anxiety, which have established themselves in the literature as key critical success factors for enhancing student retention especially in online and distance learning. Confirming Mbatia’s (2012) research Moodley et al (2023: 1374) suggest that “[w]eekly interaction between students and lecturers is essential to sustain the online presence and create a safe collaborative environment.” Moodley et al (2023: 1373) also draw particular attention to the importance of “sense of belonging” especially amongst first-generation students. They found that the challenge was exacerbated because, they note, these students “tend to receive less moral support from their families and have different (and potentially mismatching) expectations when entering their first year of tertiary education.

One critical outcome of the failure to establish an appropriate and enabling learning environment is the high dropout rates that are being recorded globally in online programmes. Moodley et al (2023) report global attrition rates ranging from 35% to 80% and reiterate the consequential far-reaching social and economic detriment for both the student and the institution. With the national commitment in the White Paper, 1997 to “access and fair chance of success”, creating an enabling environment that promotes student satisfaction, student motivation, and student retention is pivotal.

Professional staff development

While much is written about students’ capabilities regarding technology-enabled teaching and learning, the competence of academics to develop good technology-led lessons is complementary and equally critical to success. (Rabella 2018; Moloi & Salawu 2022) Training in the *use* of the new technologies for online teaching and learning is a critical step for effective

implementation – the simple truth is that teachers need to know how to use the technology well before they are properly confident to use it in the classroom. Further, and an often missed second driver of success is professional development for online teaching. Online teaching is not the same as venue-based teaching and yet academic staff are often expected to enter the new terrain without (or only limited) preparation. Given the new and different perspectives on and approaches to many of the fundamental elements of classroom teaching and learning that attach to online teaching, adequate training becomes a critical enabler of the successful implementation of e-learning. The reality is that “technology does not teach by itself. Its operative relies solely on the human expertise. Training provides capacity, skills and knowledge that will drive e-learning.” (Odunaike et al 2013: n.p.) Academics need to understand and then be actively trained in implementing the new pedagogies of online teaching and how to build effective communities.

Lecturers need to be trained in the use of technology and empowered with the skills to understand the critical success factors for online teaching and learning which include creating a presence in the online space, motivating learning through *constructive* engagement, building community, encouraging discourse, and providing prompt feedback. Moloji and Salawu (n.d.:6; 2022:206) concur that technology can improve students’ learning outcomes, but only with the support of good instructors, quality instructions, and appropriate institutional investment.

The research study conducted by Moloji and Salawu in twenty-two South African universities notes that while there remained pockets of staff not being fully competent, mostly the teaching staff “is competent to moderately competent in the use of existing technologies for teaching and learning because most faculties had provided training in an on-going basis” (2022:214). Against this backdrop they stress the centrality of continuous training provided on teaching and learning technologies under normal circumstances in the post-pandemic institution (Moloji and Salawu 2022:214). Importantly, however, staff training is not a one-size fits all and it is important that staff be asked to identify their individual needs, as well as for skills and

knowledge gaps to be identified through internal audits and module surveys undertaken with students.

7. Conclusion and recommendations

Teaching, learning, educators, students, and classrooms have all been affected by the integration of technology in education (Allen 2018:5). On a positive note, South African students, appear not to express the same reservations about online education as highlighted by their international counterparts who were critical and outspoken about poor quality of teaching and the regurgitation of previously used content that was being fed to them. The challenges most often raised by the South African student body refer to access to technology, a lack of recorded lectures, chasing deadlines rather than focusing on learning content, the lack of communication from staff, and a belief that academics have not been properly training in the use of the technology for teaching. (Essop 2021:19-20) In the STADIO SV Survey, students made no reference to “poor quality” and while there was a minority who reflected on the South African challenges identified by Essop, the majority of the respondents saw online learning as an important tool that prepared them for a workplace where technology is the norm. Summarising the South African reality, Moloï and Salawu (2022: 206) believe that:

“ Digital nativity has stimulated the passion of the current generation students for learning with technologies and a good number of students understand the skills they would require to appropriate the benefits of the fourth industrial revolution as they envisaged the impact of the era on their career.

The literature confirms that online teaching and learning is now accepted as the new normal in higher education, either as a mode on its own or blended and a pre-determined component of the traditional venue-based classroom model. However, Essop (2021:3) points out, simply accepting the new status quo without interrogating the factors of access and experience, cost, and historic realities will result in entrenching and exacerbating existing inequalities. And in this milieu, notes Moloï, aggravating the problem is the fact that “[t]eachers at both primary and high school are not provided with

the right training and development to assist them for a 4IR geared education system, while the disparity between urban and rural exacerbates the situation.” (Optimi Classroom 2023: 3) Johnson et al (2016:16) concur. They state:

The most commonly cited reason for lack of technology implementation in the classroom is inadequate professional development and training.

On the question of whether online learning may be the panacea to expand access to higher education, Atherton (2023:n.p.) posits that globally “by equity target groups and completion rates [participation in higher education] would go down and the chances of getting a graduate job for these students would reduce by 2025.” Quality online teaching takes time, effort, technical support, and requires professional staff development and instructional development costs. Many institutions see online learning as a form of massification of learning and increased revenue generation: however, quality online learning will never be a “cheap alternative”. This is the conundrum that STADIO looks to mitigate by widening access in a manner that promotes success and, at the same time, ensuring that graduates are prepared and skilled for the 21st century workplace, and a concomitantly technology-enabled world-of-work. The institution recognizes that while change and the acceleration to technology solutions should not be a tsunami, graduates also do not have the luxury of time. The transformation being wrought by technology is unprecedented, leaving little time or no opportunity to model choices and ponder options. Higher education is often playing a catch-up game, but it cannot afford to be left too far behind, especially in the graduates it produces.

These were some of the key contexts that informed the STADIO learning and teaching models. The institution is aware that in the socio-economic milieu exemplifying South Africa, while technology can be an enabler, it has the potential to equally limit success. The results of this study summarise students’ challenges with technology for learning. Confirming the importance of studies such as this one, Atherton (2023) makes the critical point that

achieving any change in this space will only be properly realized when those who are most affected by the outcomes – the students – are engaged:

“ There needs to be concerted work that is honest about the inequalities that exist in higher education participation across the world, what universities can and can’t do to address them, and work that shows how addressing these inequalities is crucial to economic and social development. (Atherton 2023:n.p.)

Research like this one and that conducted by Bharuthram and Kies (2013), Queiros and De Villiers (2016) and Moloji and Salawu^a (n.d) provides reliable data to inform decision-making and appropriate actions guiding technology-led teaching and learning.

There are striking opportunities to online learning: however, South Africa must face the stark reality of a very unequal society. Thus, emphasise Queiros and De Villiers (2023: 179), online learning must be designed considering learners needs and obstacles. STADIO acknowledges the imperatives of social justice and the concerns and challenges of students, it recognizes that they need to be taken seriously, and the obstacles identified constructively addressed if it is to be true to its commitment to leave no student behind. However, social justice does not require the adoption of the minimum standard: rather it advocates for (i) the acknowledgement of the challenges; and (ii) constructive solutions to mitigate the root causes and risk.

Based on the first STADIO SV Survey on technology-enabled learning, and using both the statistical results and the respondent vignettes which were often more vivid in highlighting student challenges, STADIO designed a framework to manage its planned improvements. The Table presented on next page takes cognizance of the intrinsic and extrinsic factors that affected the students’ learning experience. The intrinsic factors included the personal and individual realities and informing attitudes of the respondent students, as well as structural and organizational considerations of the institution, while the extrinsic factors are those issues exogenous to the institution, over which the institution has no control and no capability to mitigate the impediment/s.

Considerations affecting students' experience of technology-led online teaching and learning		
Extrinsic Factors	Intrinsic Factors	
	Institution	Students
Load-shedding (electricity shutdowns)	Programme/module design	Technology capabilities
Devices for learning are unaffordable	Staff capabilities to effectively teach using technology	Unfamiliarity with technology-led learning
High cost of data	Available technology to support students' learning	Attitude and goal-orientation/motivation to success
Unstable connectivity	Planning	
	Resourcing: <ul style="list-style-type: none"> • On-call technology support for teaching and learning • Financial provisioning • Suitable infrastructure) 	
	Professional staff development and training	

It is critical for an institution offering online learning to make a deliberate effort to know its students. This may be achieved through amongst others regular student profile surveys, especially amongst the first-year students at the registration. In addition, institutions must ensure that they have the necessary technology systems and resources that will support students in their technology-led learning activities and engagements. As highlighted by Odunaik et al (2013) projects involving technology have often failed because of inadequate planning and improper budgeting; as well as an almost frantic drive to be relevant in the 21st century without consideration for the impact, sustainability, and ramifications of initiatives and operations implemented. Institutions must pay particular attention to institutional readiness for technology-led/online learning, resources and constraints and the following could be a useful list: business readiness, stakeholder readiness, technology readiness, content management readiness, training process readiness, culture readiness, and financial readiness (Odunaik et al 2013: n.p.).

It is conceded that poor network coverage hampering access, the lack of a stable and reliable power supply, bandwidth limitations and unreliable connectivity in the rural environs are, however, societal challenges beyond the control of higher education institutions (Essop 2021: 16). Notwithstanding their existence and the inevitable constraints they carry, these factors should not restrict institutions from pursuing an agenda of technology-enabled learning. Capitulating to these challenges would be counterintuitive to the notion of higher education as a public good, the values of social justice, and the pledge in the SDGs 2030 to widen access. Rather, higher education institutions must be aware of the realities, the effect on students’ learning, and prepare to address the intrinsic considerations tabulated above to ensure the best opportunities for success for *all* students.

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9. Short biography

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