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# POWERING EDUCATION: NAVIGATING LOAD-SHEDDING CHALLENGES IN SOUTH AFRICAN OPEN DISTANCE E-LEARNING (ODEL) INSTITUTIONS.

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## ABSTRACT

*In recent years, South Africa has grappled with a persistent energy crisis that reached its peak between late 2022 and early 2023. Load-shedding, defined as regulated power outages to prevent a complete collapse of the national grid, became the defining feature of this crisis. It exposed the consequences of delayed infrastructure investment, poor maintenance, and governance failures within the energy sector. Although the frequency of load-shedding has decreased in 2025 due to improved maintenance strategies, expanded renewable energy initiatives, and stabilization efforts by Eskom, the residual effects on society, the economy, and education remain significant. This study focuses on the higher education sector, particularly Open Distance e Learning (ODEL) institutions, which are heavily dependent on reliable connectivity and ICT infrastructure. Using Urie Bronfenbrenner's Ecological Systems Theory, the study analyses how external environmental pressures, specifically electricity instability, shaped teaching practices, academic support, and student engagement during the height of load-shedding. A qualitative case study design was employed, with in-depth interviews conducted with academic staff and ICT personnel from an institution of higher learning. The findings reveal that load-shedding disrupted academic calendars, delayed feedback and supervision, compromised online teaching quality, and negatively affected staff-student communication. While recent improvements in power stability have eased some challenges, the study argues that preparedness for future energy crises remains critical. It recommends strengthening ICT resilience, diversifying energy solutions, and developing contingency plans to ensure sustainable ODeL delivery in South Africa.*

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**KEYWORDS:** Load-shedding, Open Distance e-Learning (ODEL), South Africa, Higher Education, ICT infrastructure, Teaching and Learning.

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## 1. INTRODUCTION

For several years, load-shedding has been a problem in South Africa because of inadequate electricity supply and deteriorating infrastructure. Many sectors, including education, have been negatively impacted by the frequent and erratic power outages. Load-shedding poses serious obstacles to the efficacy and continuity of online learning in South Africa, where ODeL has become essential for increasing access to education. Load-shedding is another term for power irregularities. It's a strategy for dividing up the demand for electricity among several power sources. In technical terms, load-shedding is the process of reducing the strain on an energy source when user demand for electricity exceeds the capacity of the primary source to supply it. To prevent a complete blackout of the electrical power system in the event of an unforeseen event, load-shedding or load reduction is a controlled option (Eskom, 2021). As a result of its strong economic growth over the past ten years, South Africa has had a high demand for electricity (Trace, 2020). Eskom's capacity was reached by this ongoing development, forcing it to rely heavily on reserves and resulting in power outages. The reserve margin has been declining over the past few years. Demand continues to exceed capacity even with additional capacity coming online, such as the installation of open-cycle gas turbines and the revival of idle power plants (Eskom, 2021). Unless they can significantly lower national demand, load-shedding will be required to safeguard the electrical power system until Eskom acquires additional capacity through the new build program.

The South African educational system is in terrible shape, as evidenced by the country's low results on international reading and math assessments. Even though most school instruction is not heavily reliant on electricity, load-shedding causes significant disruptions to the already overworked system, making it more difficult to make up for deficiencies in subjects like computer-based technology in many of our most impoverished schools (Booyesen, Vand Der Berg & Van Der Walt, 2023). By no means are tertiary institutions exempt from load-shedding. Most universities have installed diesel generators because research and lectures cannot wait to happen. "The daily cost of diesel at Stage 6 was reported to be R197 019 for the University of Cape Town, R892 473 for the University of Johannesburg, ZAR492 000 for North-West University, ZAR2 201 711 for the University of Pretoria, and ZAR342 939 for Stellenbosch University by data provided by the Minister of Higher

Education, Science, and Innovation in 2023. ZAR2 041 909 per day at Stage 3 and ZAR4 469 618 per day at Stage 6 was the total for the 13 universities that were covered. This does not account for the generators' maintenance costs" (Nzimande, 2023, p.3).

Institutions of higher learning specifically ODeL are heavily reliant on electricity. The majority of black South Africans, who were previously denied access to higher education due to apartheid laws and policies, continue to rely heavily on Open Distance Learning (ODL), also known as Distance Education (DE), for their educational advancement. A wide range of contemporary and/or reasonably priced technologies are used by various ODeL institutions in South Africa and throughout Africa to enable the sharing of educational materials with and among their geographically dispersed students (Ngubane-Mokiwa, 2017). Different ODeL institutions in South Africa and on the African continent use a wide variety of modern and/or affordable technologies to facilitate the sharing of learning content with, and among their geographically distant students (Ngubane-Mokiwa, 2017, p.111). By their very nature, ODeL institutions provide educational opportunities to mature non-traditional, working students who are often unable to access higher education in full-time, contact, and campus-based institutions. Further, the ODeL framework is premised on the assumption that every student learning can be supported by modern electronic technologies and other digital facilities. Also, ODeL students are assumed to have the ability to make optimal use of modern electronic technologies to access their study material and to interact with their lecturers without necessarily being required to make physical contact (Ngubane-Mokiwa, 2017, p.113)

The aim of this study is to explore the various difficulties that load-shedding places on lecturers and ICT personnel in ODeL institutions. The smooth operation of educational institutions is significantly impacted by load-shedding, a problem that is common in South Africa, especially for those that rely heavily on digital infrastructure. This study's justification is the urgent need to comprehend and resolve the difficulties that instructors and technical staff encounter in the context of ODeL during blackouts. Due to the growing reliance on electronic platforms for both administrative and instructional purposes, load-shedding can cause disruptions that hinder the educational process. Furthermore, this study aims to provide important insights that can inform strategies for reducing the impact of load-shedding on ODeL institutions by looking at the

experiences and viewpoints of lecturers and ICT staff. In the end, this research will help the education sector become more resilient and adaptable in the face of energy challenges.

### 1.1. Research Questions

Guided by the aim of exploring the difficulties that load-shedding places on lecturers and ICT personnel within Open Distance e Learning (ODEL) institutions, this study seeks to generate insights that can inform strategies for improving institutional resilience and adaptability. To achieve this, the following research questions are posed:

RQ1: What challenges do lecturers and ICT personnel experience in sustaining teaching, learning, and administrative activities in ODeL institutions during periods of load-shedding?

RQ2: How can the insights from lecturers and ICT personnel inform strategies to strengthen the resilience and adaptability of ODeL institutions in the face of ongoing energy disruptions in South Africa?

## 2. LITERATURE REVIEW

The nation's socioeconomic progress is thought to be fueled by education. Despite the historical perception that education was only for privileged people, all racial and cultural groups are now welcome to apply. The Department of Higher Education made university studies more accessible to a greater number of students nationwide who had previously been denied access to mainstream higher education, to close the educational gap that had previously existed. To accommodate more students, the traditional university education system was encouraged to implement online learning (Lumadi, 2021). With the advent of ODeL, classes are now held remotely from traditional lecture halls. The system was supposed to boost participation and have a high completion rate while remaining mostly inclusive and flexible. The term "student support" refers to a broad range of services provided by educational institutions to help their students meet their learning objectives, advance their knowledge, and successfully finish their coursework (Ngubane-Mokiwa, 2017, p.112)

In the meantime, the traditional tertiary institutions in South Africa were faced with numerous challenges, among which were many enrolments resulting in overcrowded lecture halls and the retention of students. ODeL was introduced to complement the traditional educational system and to accommodate the increasing numbers and growth of higher institutions. Although ODeL is not

new in the country, its introduction radically changed the tertiary education landscape. Several measures were instituted to deal with the challenges of the transformation. Notably, among the measures to curb the numerous challenges faced by the traditional and online learning institutions was the student support system.

The student support system was created with a multi-cultural approach so that it could embrace all cultures and races in the country. According to Lehong, Van Biljon, and Sanders (2019), ODeL is concentrated on lowering barriers to learning, offering flexible learning, being student-centered, assisting students, and creating high-quality learning programs with the hope that students will succeed. Through discussion boards like Facebook, YouTube, and WhatsApp, educational online technologies for social collaboration support learning. The success of students may increase if these technologies are incorporated with learning management systems. Irrespective of the time or location of access, e-learning is the process of learning that is aided, enhanced, and supported by Information and Communication Technology (ICT) (Lehong, Van Biljon & Sanders, 2019). Learning Management Systems (LMSs) are a tool used by ODeL institutions to support teaching and learning. An integrated software system, or LMS, helps with student learning, reporting, administration, and the online management and delivery of educational courses and content.

In ODeL institutions, the use of an LMS facilitates communication between students and faculty, administrators, peers, and lecturers. To facilitate and manage learning activities, learning management systems (LMSs) integrate cutting-edge tools, technologies, and features. Content management, communication, student assessment, assignment submission, and library services and resources are a few examples of tools (Watson & Watson, 2017).

### 2.1. State Of Load-Shedding In South Africa

The South African Department of Minerals and Energy published a White Paper in 1998 outlining the nation's energy policies. According to the paper, if no more power was added to the national grid by 2007, demand for electricity would outpace supply due to the annual growth in predicted demand. The Department of Minerals and Energy (1998) stated in a paper that "timely steps will have to be taken to ensure that demand does not exceed available supply capacity and that appropriate strategies, including those with long lead times, are implemented in time." The first load-shedding was put into place in late

2007 and lasted until March 2008. Since then, load-shedding has been used sporadically over the years; the worst load-shedding event to date occurred in 2022, with well over 1,900 hours without power. In comparison to 2008, Eskom sold less electricity in 2022, and the energy availability factor decreased from 85% in 2008 to 62% in 2023 (Daily Investor, 2023). Since the inauguration of democracy in South Africa, the amount of energy consumed by each household has increased. This is mostly because of the numerous electrification initiatives implemented by the South African government, which have made electricity available to over 85% of the nation's households (Inglesi-Lotz & Bohlmann, 2018)

## **2.2. The Causes Of Load-Shedding In South Africa**

Eskom, responsible for managing the country's electricity supply, has grappled with underinvestment, mismanagement, and delays in infrastructure development, leading to an increasingly precarious power grid (Makholwa, 2019). The causes of load-shedding include, firstly, the underinvestment and Infrastructure challenges. Eskom faces difficulties in maintaining and upgrading aging power plants and infrastructure due to inadequate investment, resulting in a widening supply-demand gap (ANC, 2020). Secondly, the financial mismanagement within Eskom. Eskom's financial woes, fuelled by corruption and mismanagement, have hindered its ability to fund essential maintenance and expansion projects (Pule, 2021). Third is the dependency on coal. South Africa's heavy reliance on coal for power generation has left the nation vulnerable to disruptions in the coal supply chain, exacerbating operational challenges for Eskom (Eberhard et al., 2014). Lastly, is the policy and regulatory Issues on energy in South Africa. Inconsistent energy policies and regulatory uncertainties have impeded the development of alternative energy sources and private sector involvement, perpetuating the energy crisis (NPC, 2011).

## **3. THEORETICAL FRAMEWORK**

There are two theories underpinning the exploration of challenges brought by load-shedding in ODeL institutions. Firstly, connectivism, as theorized by Siemens (2004), provides a valuable framework for understanding and enhancing the educational landscape of ODeL institutions. In the digital age, where information is abundant and rapidly evolving, connectivism emphasizes the importance of networks, both human and

technological, in the process of knowledge acquisition.

### **3.1. Connectivism Learning Theory**

Conventional theories of learning usually focus on the interactions that occur between students and teachers as well as between students and other students. Connectivism takes a slightly different stance when it comes to the roles and interactions that exist between educators, students, and their peers. According to connectivism, developing connections within a network is the source of competence. The instructor no longer has authority or superior knowledge to instruct the students. Instead of acting as a formal instructor, the teacher in connectivism serves as a peer, a moderator, and a facilitator. It is believed that teams can offer a means of managing the growing complexity surrounding knowledge, learning, and decision making, rather than any one individual possessing all the knowledge (Abuhammad, 2020).

The infrastructures offered by ODeL offer an optimal setting for the application of Connectivism Learning Theory. In an ODeL setting, students come from a variety of cultural backgrounds and are geographically scattered, resulting in a rich tapestry of experiences and viewpoints. In these kinds of environments, connectivism flourishes by creating a global learning community (Kop & Hill, 2008). By actively interacting with peers, teachers, and outside experts, learners can build their networks and obtain access to a wide range of information sources.

There are many opportunities in ODeL environments to use technology for collaborative learning and knowledge sharing. Social media platforms, discussion boards, and virtual classrooms serve as the hubs of connectivism networks, enabling constant communication and engagement (Koutropoulos, 2014). Students can interact with multimedia-rich content, take part in online group projects, and create new knowledge as a group. Additionally, instructors can identify learning patterns and modify their teaching strategies by using analytics provided by ODeL platforms to track learners' engagement, preferences, and interactions (Jaggars & Xu, 2016). Because of ODeL's flexibility, students can tailor their learning paths to meet their specific needs and build on their strengths (Ally, 2008).

In the context of load-shedding in ODeL institutions, an analysis of connectivism looks at changes in organizations, the nature and source of knowledge, the evolution of learning, and technological trends (Abuhammad, 2020). Four

pillars of learning, namely, autonomy, connectedness, diversity, and openness, are outlined by the connectivism theory.

### **3.1.1. Autonomy**

Autonomy, which means "self" and "independent" in Greek, is the quality of being self-governing. It has to do with how self-directed learners approach their own learning according to connectivism. Without following the conventional teaching process, they are expected to make their own connections and select pertinent information sources. Learners can thus acquire autonomy over their own knowledge, its distribution, and its velocity while minimizing the control and power structure of teachers (Abuhammad, 2020, p.2). Moreover, the "desire to foster deep network connections" based on feelings, reflection, logic, and reasoning is how Siemens (2004, p.13) characterizes the significance of motivation in fostering receptivity to network learning.

### **3.1.2. Connectedness**

In a study, Abuhammad (2020) postulates that while connectivism acknowledges that knowledge is about the networked connections of people and computers, psychology views connectedness as having to do with sociability and relatedness. According to Dunaway (2012, p.3), "the idea that learning takes place across networked learning communities and information technologies is central to connectivism." Connectivism emphasizes how important information from networked sources is within the learning process. According to connectivism, learning happens when peers interact and exchange ideas, opinions, and viewpoints through a cooperative process. Although they are part of the network, teachers no longer play the role of the teacher in the traditional sense; instead, they take on the role of a connected peer who facilitates interactions rather than an authoritative figure.

### **3.1.3. Diversity**

Diversity in connectivism is typically defined in terms of demographic diversity (gender, race, culture, socioeconomic status, etc.), and it symbolizes the individuality and inventiveness of network members who are adding to the collective. Since teachers are no longer the only source of information and experience, students are encouraged to seek out the advice, ideas, and suggestions of others (Abuhammad, 2020, p.2).

### **3.1.4. Openness**

In the context of connectivism, openness is understood as the interchange of concepts, materials, and artifacts within the network system. It is associated with curiosity, exploration, and creativity. Opting in or out of the network allows users to interact with it freely according to their own pace, interests, and level of participation (Abuhammad, 2020, p.2). Connectivism acknowledges how digital technologies have a transformative effect on education (Siemens, 2005). Since ODeL institutions were at the forefront of electronic learning, these institutions are in a good position to take advantage of electronic platforms, interactive simulations, and multimedia content. Technology is used in ODeL to improve accessibility and engagement while offering students a wide range of learning resources. The incorporation of digital tools promotes interactive and participatory learning experiences in addition to making knowledge distribution easier.

In ODeL, where learners may be geographically dispersed, the concept of distributed knowledge takes center stage. Connectivism posits that the collective knowledge of a network is a valuable resource (Siemens, 2004). ODeL institutions can harness this distributed knowledge by promoting collaborative projects, group discussions, and peer-to-peer learning. Virtual classrooms and online study groups serve as platforms for the exchange of diverse perspectives, enriching the learning experience with a variety of cultural and contextual insights.

## **3.2. Ecological Systems Theory**

The second theory used in understanding educational processes in the digital age can be gained by integrating Bronfenbrenner's Ecological Systems Theory with Online ODeL. Since ODeL is a teaching strategy that uses technology to give students remote access to instructional materials and resources (Moore & Kearsley, 2005), researchers can examine how different ecological systems in which learners are embedded interact with online learning environments by using ODeL within the framework of ecological systems. Urie Bronfenbrenner created the ecological systems theory in 1979, which provides a thorough and all-encompassing framework for comprehending human development. Fundamentally, the theory suggests that people are not separate entities, but rather are a part of several interrelated systems that shape their growth.

Urie Bronfenbrenner created the ecological systems theory in 1979, which provides a thorough and all-encompassing framework for comprehending human development. Fundamentally, the theory suggests that people are

not separate entities, but rather are a part of several interrelated systems that shape their growth. According to the ecological systems perspective, human development is a dynamic process that is influenced by how people interact with their surroundings. The micro-system, meso-system, exo-system, macro-system, and chrono-system are the five interconnected systems that make up these environments (Bronfenbrenner, 1979).

The ODeL micro-system consists of digital interactions, virtual classrooms, and online courses where students interact with peers, teachers, and course material directly. The calibre of interactions in this micro-system will have a big impact on the results and experience of learning (Bronfenbrenner, 1979). Additionally, the relationship between the online learning environment and other educational contexts, like conventional classrooms or workplace settings, is a component of the ODeL meso-system. Knowing these links can help clarify the possible advantages or difficulties of combining online and in-person learning methods.

The ODeL platforms and policies may have an indirect impact on the opportunities and experiences of learners within the exo-system. The availability and accessibility of ODeL can be influenced by institutional policies, governmental regulations, and technological infrastructure, which can have an impact on student participation and success rates. Notably, the cultural norms and values associated with digital learning are incorporated into the ODeL macro-system. Learners' engagement with ODeL and academic outcomes may be impacted by societal attitudes toward online education, cultural differences in digital literacy, and access.

Within the chrono-system, ODeL is a dynamic and ever-evolving phenomenon that is impacted by shifts in society views, educational practices, and technological advancements. The educational landscape and the experiences of learners will be impacted by the development of online learning platforms, the introduction of new educational technologies, and changes in educational paradigms (Bronfenbrenner, 1979).

#### 4. RESEARCH METHODOLOGY

Within the context of ODeL, this study aimed to explore the challenges encountered during load-shedding and offer recommendations for improving readiness for future energy crises. A qualitative research methodology was selected to explore in detail the complex issues related to online and distance learning during load-shedding. It was also determined that qualitative research would be most

appropriate for the present study, as it offers a thorough understanding of people's experiences and perspectives in their natural environments (Creswell, 2013). This study adopts a qualitative case study design, focusing on a single ODeL institution in South Africa. ODeL is a relatively new but rapidly growing system following the COVID-19 pandemic, making this case illustrative of national adaptation to hybrid and online learning

##### 4.1. Sample And Sampling Method

The study's target population consisted of employees chosen through purposive sampling from an ODeL Institution. This methodology facilitated the inclusion of participants with relevant experiences and perspectives related to the impact of load-shedding on ODeL. Given their crucial role in overseeing technology infrastructure in times of crisis, ODeL's institutional ICT personnel were also included in the sample. The goal of including a range of perspectives was to present a thorough understanding of the impacts of load-shedding and possible solutions.

Sampling and Data Saturation: Seven participants were purposively selected to represent key functional roles within the institution, including academic, technical, and administrative roles. Although the sample size (n=7) may appear small, it aligns with case study conventions that prioritize depth over breadth. Saturation was reached when successive interviews produced no new insights or themes.

**Table 1: Biographical Information.**

Respondent 1	Corrections Management	Lecturer
Respondent 2	ICT	IT Specialist
Respondent 3	Policing	Lecturer
Respondent 4	ICT	IT Specialist
Respondent 5	Criminology and Security	Lecturer
	science	
Respondent 6	Corrections Management	Lecturer
Respondent 7	Policing	Lecturer

##### 4.2. Data Collection

The primary means used to gather data was in-depth interviews. Merriam (2009) asserts that in-depth interviews facilitate the examination of unique experiences and viewpoints, providing a nuanced understanding of the phenomenon under investigation. To ensure consistency in data collection, a semi-structured interview guide was developed, featuring open-ended questions that allowed participants to elaborate on their experiences and share their insights (Patton, 2015).

### **4.3. Data Analysis**

In this study, thematic analysis was employed to identify and examine new themes in the interview data. The data were categorized, preliminary codes were generated, themes were searched for, reviewed, defined, and named, and finally, the final report was produced, in accordance with Braun and Clarke's (2006) six-step methodology. This approach enabled the examination of qualitative data methodically and yielded insightful findings.

**Thematic Analysis and Coding:** Data were analysed through an inductive thematic approach. The process involved (1) initial immersion and repeated reading of transcripts; (2) open coding of recurring patterns relating to energy disruptions, technological adaptation, and policy response; (3) grouping of codes into broader themes reflecting systemic and individual levels; and (4) synthesis guided by Connectivism and Bronfenbrenner's systems. This process ensured analytical transparency and theoretical alignment.

### **4.4. Ethical Considerations**

All participants gave their informed consent, stressing the importance of their voluntary participation, confidentiality, and ability to withdraw from the study at any time. In reporting the results, participant identities were shielded using pseudonyms.

### **4.5. Results**

The major findings of the study, which aimed to explore the profound impact of load-shedding on ODeL at an academic institution, are presented below. Load-shedding, a controlled power outage implemented by the electricity provider, has been a persistent issue in many regions of South Africa, and its effects on education, particularly in the context of online learning, are of great concern. We examined how load-shedding affected various aspects of ODeL, including student-teacher interactions, connectivity, academic planning, ICT infrastructure, and examinations.

#### **4.5.1. Theme One: Adverse Effects On Academic Calendars And Scheduling**

The planning and implementation of academic calendars were significantly impacted by load-shedding. Unplanned power outages disrupted the continuity of courses, resulting in scheduling difficulties and potential overlap between classes. A lecturer from the department said.

"Load-shedding has caused chaos in our academic schedules. The conditions created by the abrupt power outages are chaotic, making it challenging to keep the courses running continuously. We are experiencing scheduling difficulties, and there is a significant risk that these disruptions will result in course overlaps. Moreover, the unpredictable nature of load-shedding presents an additional difficulty. Important academic activities have become logistical nightmares to plan and carry out. This unpredictability in the academic calendar affects more than just our inconvenience; it also has larger consequences for our academic advancement and the institution's general strategy".

Furthermore, the unpredictability of load-shedding made it challenging to plan and execute important academic events. This instability in the academic calendar could have far-reaching consequences on students' academic progress and institutional planning.

#### **4.5.2. Theme Two: Detrimental Effects on Examinations and Assessments**

Load-shedding caused significant operational challenges during examinations and assessments. Power outages disrupted online exam sessions, leading to disconnections and potential data loss. A lecturer described the challenges they face as follows;

"Power failures turned into serious disruptors during online tests, causing disconnections and perhaps losing important assessment data. Students have been visibly anxious because of the delayed announcement of their results. The ongoing issue of load-shedding in the education sector is not merely a temporary inconvenience, but rather a driving force behind operational disorder".

Moreover, delays in marking due to load-shedding affected the timely release of results, causing anxiety and uncertainty among students. The reliability and integrity of online assessments is compromised, demanding the development of contingency plans and alternative assessment methods to minimize the impact of load-shedding.

#### **4.5.3. Theme Three: Prolonged Downtime Of ICT Infrastructure**

Load-shedding resulted in prolonged downtime of the institution's ICT infrastructure. When power was restored after an outage, it often took a significant amount of time to rectify issues and bring the systems back online. An ICT specialist expressed that.

"One of the biggest threats to the smooth operation of our universities' ICT infrastructure is load-shedding. The downtime that follows an unexpected power outage is more than just a brief inconvenience. Reviving the systems is a lengthy process that affects many aspects of academic operations. After an outage, the restoration procedure can take a few seconds to a long time, obstructing administrative duties, communication channels, and access to essential learning resources".

Additionally, the downtime caused by load-shedding had a cascading effect on various academic operations, including access to learning resources, administrative tasks, and communication channels. It emphasizes the need for investing in robust backup power solutions and efficient maintenance strategies for ICT infrastructure.

#### **4.5.4. Theme Four: Impediments To Postgraduate Supervision**

Load-shedding had adverse effects on postgraduate supervision, which heavily relies on consistent and reliable communication between supervisors and students. One of the lecturers, who is a postgraduate supervisor, made this revelation.

"Postgraduate supervision is severely impacted by load-shedding. The regular stage hikes have made it extremely difficult for us to be in constant contact with our postgraduates. Due to these aggravating delays in research development, the students and I are having to deal with the effects. Because load-shedding is unpredictable, we must reschedule meetings and our communication strategies and put backup plans in place to make sure the postgraduate research process is flexible".

With power outages causing disruptions, supervisors have struggled to maintain regular contact with their students, leading to delays in research progress and increased frustration for both parties. Load-shedding's impact on postgraduate supervision calls for alternative communication strategies and contingency plans.

#### **4.5.5. Theme Five: Delays And Disruptions In Student Engagement And Presentations**

Load-shedding caused delays and disruptions in student engagement, particularly during synchronous online sessions. One of the lecturers

shared that;

"A significant obstacle in our teaching and learning is now load-shedding. When you're fully participating in an online discussion and the power suddenly goes out, it can be annoying. The entire session is disrupted, you lose connection, and important information is missed. Not only is it inconvenient, but it also hinders our ability to engage in meaningful participation and work effectively with students. It becomes difficult to even share presentations or access course materials, which seriously disadvantages us".

These disruptions could hinder active participation and limit the effectiveness of collaborative activities. Additionally, students faced difficulties in sharing presentations or accessing course materials during periods of power outages. This interruption in the flow of information hindered the learning process and potentially impacted the overall learning outcomes for students.

#### **4.5.6. Theme Six: Audio Quality And Connectivity Challenges**

Another notable impact of load-shedding was the deterioration of audio quality and internet connectivity during online classes. A lecturer indicated that;

"Load-shedding has had a significant impact on our online teaching and learning. The most frustrating aspect is the consistently poor audio quality. We often found ourselves straining to hear the instructor in workshops, seminars, or online presentations, which results in miscommunications and a decrease in the level of participation. It's more than just a few words missing; the speaker or the students' main idea is lost. And the link to the internet during the live session is terrible. You're constantly on edge, fearing that the next outage will cause you to lose connection and ruin the lesson plan".

The above posed a considerable challenge to effective communication between instructors and students. Poor audio quality led to misunderstandings and reduced student engagement. Additionally, unreliable internet connections caused frequent disconnections during live sessions, further disrupting the learning experience. Load-shedding's negative impact on audio quality and connectivity underscores the need for backup solutions and strategies to mitigate its effects on ODeL.

#### **4.5.7. Theme Seven: Disruptions In Student-Teacher Interactions And Timely Feedback**

One of the primary findings of this study is that load-shedding significantly disrupted staff members' ability to respond to student queries and provide timely feedback. A lecturer expressed that.

"As a lecturer, I have been severely compromised so is my ability to effectively engage with students due to persistent load-shedding. I am sometimes unable to access online teaching platforms due to irregular power outages, which makes it difficult to answer student questions quickly and give them the timely feedback they need to advance academically. There's an obvious emotion of frustration among us as university staff, as well as the students who depend on regular updates and assistance. It is impossible to exaggerate the detrimental effects on student performance".

With electricity outages resulting in periods of no power, staff members were unable to access their online teaching platforms on a regular basis. This hindered their responsiveness to student inquiries, causing frustration and hampering the learning process for students. Timely feedback is crucial for student progress, and the disruptions caused by load-shedding may have adversely affected student performance.

#### **4.6. Discussions**

The results of the study provide insight into the significant effects that load-shedding has on ODeL at a university. Several aspects of ODeL were severely impacted by the load-shedding disruptions, including student-teacher relationships, audio quality and connectivity, student engagement, postgraduate supervision, academic planning, ICT infrastructure, and exams. Institutions that offer online distance learning programs have been particularly severely impacted by South Africa's load-shedding energy issue, which is characterized by frequent power outages.

The literature supports the adverse impact of load-shedding on timely feedback and student-teacher interactions. According to studies by Asgher and Hanif (2021), disruptions to communication channels can cause instructors to become less responsive, which in turn lowers student satisfaction and learning outcomes. The results of this study support these concerns by showing that communication disruptions caused by load-shedding may impair learning and prevent students from making progress.

The decline in internet connectivity and audio quality that occurs during load-shedding is consistent with research on the effects of internet outages on distance learning (Robinson, 2017). In

online classes, poor audio quality and erratic internet connections can cause students to become less engaged, making it harder for them to understand the material and leading to frustration, which can affect both teachers and students. To maintain efficient online learning during load-shedding, backup power solutions should be implemented, and methods for optimizing audio and video transmission under challenging conditions should be explored.

The research on the value of simultaneous and collaborative activities in online education is consistent with the impact of load-shedding on student engagement and presentation sharing (Jordan & Duckett, 2018). According to them, successful ODeL requires active participation and engagement, and disruptions caused by load-shedding can impede these interactive processes. To mitigate the negative effects of power outages on student engagement, educational institutions should consider implementing asynchronous alternatives and encouraging blended learning.

The impact of load-shedding on postgraduate supervision is consistent with earlier research's concerns about the difficulties of online mentoring and advising (Nasiri & Mafakheri, 2015). Load-shedding can cause delays in the advancement of research and possibly cause annoyance for both parties by interfering with the regular support and communication between postgraduate students and their supervisors. Organizations should prepare backup plans and encourage managers to maintain constant contact with subordinates through alternative channels during power outages.

According to studies on disruptions caused by external factors in educational settings, load-shedding has a negative impact on academic planning and scheduling challenges (Oluwasuji, Malik, & Ramchurn, 2020). Unexpected power outages have the potential to cause scheduling conflicts or overlap in courses by upsetting the regular order of business in the academic calendar. The significance of institutional readiness to manage load-shedding-related scheduling disruptions is highlighted by this study.

More research on the effects of power outages on information technology systems supports the extended outages of ICT infrastructure during load-shedding (Rakotonirainy, Durbach, & Nyirenda 2019). Prolonged outages can make it more difficult to access administrative duties, communication channels, and learning materials, which will negatively impact ODeL's overall functionality. Institutions should invest in reliable backup power

options and implement effective ICT infrastructure maintenance procedures to reduce downtime.

The negative consequences of load-shedding on exams and assessments are consistent with studies on the difficulties of administering online exams (Brown & Thomas, 2022). Exam sessions may be disrupted by power outages, which may result in disconnections and possible data loss. Students may experience anxiety and uncertainty because of marking delays. To guarantee the validity and consistency of assessments during load-shedding, institutions need to create backup plans and consider alternate evaluation techniques.

## 5. CONCLUSIONS

In conclusion, this study has offered an exploration of the challenges faced by academics and the Information and Communication Technology infrastructure when delivering Open Distance Electronic Learning in South Africa during the load-shedding-related energy crisis, especially in the latter half of 2022 and the first part of 2023. The theoretical framework enabled an examination of the complex effects of load-shedding on academic staff at the micro, meso, exo, and macro-system levels. It was based on Urie Bronfenbrenner's Ecological Systems Theory and Siemens' Connectivism. The results highlight the serious disruptions that staff members had to deal with, which had an impact on their overall academic planning, student communication, and instructional strategies.

### 5.1. Recommendations

This study recommends that South African ODeL institutions strategically address the challenges posed by frequent load-shedding through multiple approaches. To ensure seamless operations, institutions are advised to invest in sturdy backup power solutions, implement blended learning strategies, and enhance the resilience of their ICT infrastructure.

- **Invest in Sturdy Backup Power Solutions:** Institutions of Higher learning in South Africa are urged to invest in reliable backup power solutions to mitigate the impact of load-

shedding on educational activities. Specifically, the deployment of solar power systems and generators is recommended. These solutions can ensure uninterrupted access to electricity, facilitating the smooth continuation of online exams, classes, and administrative tasks even during power outages. By prioritizing the implementation of such backup options, institutions can maintain operational continuity and minimize disruptions caused by unreliable power sources.

- **Create Strategies for Blended Learning:** In response to the challenges posed by load-shedding, academic institutions should adopt a blended learning approach that incorporates both synchronous and asynchronous learning methods. By providing asynchronous resources such as discussion boards, recorded lectures, and supplementary materials, institutions can mitigate the adverse effects of power outages on in-person interactions and student engagement. This strategy allows for flexibility in learning and ensures that educational activities can proceed efficiently, irrespective of power disruptions.
- **Conduct Periodic Assessments:** The ODeL Institutions should regularly assess the impact of load-shedding on ODeL and gather feedback from staff and students. These assessments can provide insights into areas that require improvement and inform future strategies to cope with load-shedding.
- **Boost ICT Infrastructure Resilience:** To enhance the resilience of Information and Communication Technology (ICT) infrastructure, academic institutions are advised to implement measures that withstand power outages and fluctuations. Regular maintenance and upgrades of servers, network equipment, and power backup systems are imperative to reduce downtime during load-shedding. By fortifying the ICT infrastructure, institutions can maintain the integrity of online platforms, data storage, and communication.

**Availability of Data and Materials:** The study is a narrative review and does not involve the collection or analysis of original data from participants. All information and insights presented in the study are derived from existing literature, publicly available sources, and secondary data obtained from previous research. As such, no new datasets were generated or analysed during the study.

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