ETDP-SETA IMPACT OF COVID-19 STUDY

BUILDING A RESILIENT SKILLS ECOSYSTEM: SITUATIONAL ANALYSIS REPORT ON THE FORWARD PATH OF EDUCATION AND TRAINING IN LIGHT OF THE PANDEMIC AND 4IR/5IR SHIFTS IN THE ETD SECTOR

SCHOOLING SUBSECTOR

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Table of Contents

List of Figures

List of Tables

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APPROVAL OF THE RESEARCH REPORT:

FINAL REPORT ON BUILDING A RESILIENT SKILLS ECOSYSTEM:
SITUATIONAL ANALYSIS REPORT ON THE FORWARD PATH OF EDUCATION AND TRAINING
IN LIGHT OF THE PANDEMIC AND 4IR/5IR SHIFTS IN THE ETD SECTOR

HIGHER EDUCATION SUBSECTOR

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List of Abbreviations

Abbreviation	Description
4IR	Fourth Industrial Revolution
5IR	Fifth Industrial Revolution
BEd	Bachelor of Education
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
ETD	Education, Training and Development
ETDP SETA	Education, Training and Development Practices Sector Education and Training Authority
GET	General Education and Training
HEI	Higher Education Institution
HSRC	Human Sciences Research Council
ICT	Information and Communications Technology
MTEF	Medium-term expenditure framework
NECT	National Education Collaboration Trust
NIDS-CRAM	National Income Dynamics Study – Coronavirus Rapid Mobile Survey
NGO	Non-Government Organisation
NQF	National Qualification Framework
PGCE	Post Graduate certificate in Education
PDE	Provincial Department of Education
PYEI	Presidential Youth Employment Initiative
SAIDE	South African Institute for Distance Education (SAIDE)
SETA	Sector Education and Training Authority
StatsSA	Statistics South Africa
TIMMS	Trends in International Mathematics and Science Study
TSM	Three Stream Model

APPROVAL OF THE RESEARCH REPORT: BUILDING A RESILIENT SKILLS ECOSYSTEM: SITUATIONAL ANALYSIS REPORT ON THE FORWARD PATH OF EDUCATION AND TRAINING IN LIGHT OF THE PANDEMIC AND 4IR/5IR SHIFTS IN THE SCHOOLING SUBSECTOR.

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ABSTRACT

The COVID-19 pandemic has triggered unprecedented disruptions across various sectors, particularly in education and training. The Education, Training, and Development Practices Sector Education and Training Authority (ETDP SETA) explored the profound impact of the pandemic within the framework of the Fourth Industrial Revolution (4IR) on its constituencies. This report focuses on the Schooling subsector in South Africa. The analysis delves into the dynamic shifts in technology, skills demand, and learning paradigms brought about by the intersection of the 4IR and the pandemic. Grounded in a detailed examination of the state of the Schooling subsector, the report provides a comprehensive breakdown of learner, educator, and school statistics by province. The report furthermore discusses the state of the subsector both before and after the pandemic to illustrate pre-existing challenges as well as responses to COVID-19 and resultant changes. The report presents allocation and prioritisation of resources as well as identified information gaps from thorough review of the available literature. The report concludes by summarizing key findings and offering recommendations for the Education and Training Development (ETD) sector. These recommendations are designed to enhance education and training provisioning, aligning with the overarching goal of building back better post-COVID-19. The evidence review presented in this report contributes to informed policy decisions, resource allocation, and targeted interventions, ensuring resilience in the face of challenges posed by the pandemic and the transformative impacts of the Fourth Industrial Revolution. The ultimate aim is to support students, teachers, and educational institutions in South Africa on their journey towards adapting to the evolving landscape of education.

1   INTRODUCTION AND CONTEXT

The Coronavirus (COVID-19) pandemic has had an unprecedented impact on the national economy, creating uncertainties regarding the scope and nature of implications for various sectors. The education and training sector is no exception, with students, employers, and employees all being affected. The ETDP SETA, mandated with promoting and facilitating skills development with the aim of improving the skills profile of the workforce in the education, training, and development sector, now faces the arduous task of planning for and implementing policy that will position the sector well to respond to the implications of COVID-19.

However, planning, policymaking, and implementation require a clear assessment of the impact of COVID-19 on its 14 constituencies or sub-sectors of which schooling is one. Obtaining robust intelligence on the state of skills supply, demand, and shortages within the sector is at the heart of this endeavour. Additionally, reflecting on the emerging skills and related challenges is necessary to inform the planning and implementation of appropriate interventions, as well as general funding decisions and allocation of resources from the SETA to support its various sub-sectors.

The fundamental concern facing the ETDP-SETA and the main objective of this study has been to determine the impact of the COVID-19 pandemic within the context of the fourth industrial revolution on the education and training sector. This requires engagement within the context of the Fourth Industrial Revolution (4IR) and its impact on skills development training needs and interventions. With the dual challenges of the 4IR and the COVID-19 pandemic, the education and training sectors are undoubtedly facing unprecedented upheavals. The 4IR, characterised by breakthroughs in fields like AI, robotics, and the Internet of Things, demands new skill sets and learning paradigms. Coupled with the disruptions caused by the pandemic, understanding this impact is pivotal for future planning and ensuring the relevancy of education, training, and skills development.

Towards this end, this evidence review focuses on what is known about the status of **skills development and labour market** information recovery arising from COVID-19 and changes because of 4IR/5IR. The structure of the report following this brief introduction is as follows:

Section Two Maps the sub-sectoral context of the schooling sector and is followed in Section Three by an assessment of the schooling sector pre-COVID-19. Section Four examines the impact of COVID-19 on the schooling sector and includes an assessment of the emerging trends in staffing and occupational profiles, new work methodologies, curricular reforms, shifts in skills and training practices and the role of technology in response to COVID-19 and the 4IR. This is followed by Section Five which explores the financial implications of the COVID-19 pandemic and schooling sector resources availability. Section Six reflects on the current or future priorities identified by the ETDP SETA to address the impacts outlined in earlier sections and this is followed by Section Seven which provides a brief assessment of the gaps in information on areas which have a direct impact on the ability of the ETD sector to support recovery. Section Eight concludes the report with a summary of findings and recommendations for the ETD sector in enhancing its education and training provisioning as it aims to build back better.

2   MAPPING THE SUBSECTORAL CONTEXT

The ETDP SETA's scope in the schooling sub-sector is detailed in the 2023-2024 ETD Sector Skills Plan (ETDP SETA, 2022a) which outlines all the relevant national legislation, policy prescriptions and national development plans under which it operates. The National Department of Basic Education (DBE) and Provincial Departments of Education (PDEs) share responsibilities for the education subsector with private-sector providers.

The key role players in the schooling sector are the National Department of Basic Education, the Provincial Departments of Basic Education, School Governing Bodies, non-governmental organisations (such as Equal Education, the Centre for Development Enterprise and the Centre for Education Policy Development), the National Alliance of Independent schools Associations, Trade Unions, the South African Council for Educators and the Department of Transport (ETDP SETA, 2022a).

This section seeks to provide an overview of the context within which the Schooling subsector operates. It is recognised that the schooling sector is a critical sector that plays a vital role in the development and well-being of children and youth. By examining the sectoral context of the schooling sector in South Africa, it can support the identification of the specific challenges, opportunities, and interventions needed to mitigate the impact of COVID-19 on education. This understanding can inform policy decisions, resource allocation, and targeted interventions to support students, teachers, and educational institutions in South Africa during and after the pandemic.

2.1.   Profile of Stakeholders

The South African schooling system is divided into two bands:
- General Education and Training (GET) which consists of three phases: the foundation phase from grade R to grade 3; the intermediate phase from grade 4 to grade 6; and the senior phase from grade 7 to grade 9. Special needs education is included in GET.

- Further Education and Training (FET) which includes school grade 10 to grade 12 and FET for colleges and technical schools which include National Qualification Framework (NQF) Levels 2, 3 and 4).

In 2022, there were 13 419 971 learners in 24 871 public and independent schools in South Africa, and approximately 450 993 educators (DBE, 2022e). Table 1 shows the total number of learners, educators, and schools by province in both public and independent schools. The highest enrolments of learners and educators are found in KZN and Gauteng provinces for both public and private schools as seen in Table 1 and Table 2 below.

Table 1: Number of Learners, Educators & Schools in the School Sector, by Province, 2022

| Province | Public and Independent Schools | | | | | |
	Learners	As % of National Total	Educators	As % of National Total	Schools	As % of National Total
Eastern Cape	1 826 150	13.6	61 404	13.6	5 311	21.4
Free State	728 844	5.4	24 343	5.4	1 029	4.1
Gauteng	2 611 641	19.5	93 453	20.7	2 991	12.0
KwaZulu- Natal	2 883 354	21.5	95 650	21.2	6 021	24.2
Limpopo	1 798 646	13.4	54 592	12.1	3 847	15.5
Mpumalanga	1 145 287	8.5	37 579	8.3	1 784	7.2
Northern Cape	306 056	2.3	10 667	2.4	586	2.4
Northwest	875 095	6.5	28 923	6.4	1 548	6.2
Western Cape	1 244 898	9.3	44 382	9.8	1 754	7.1
National	**13 419 971**	**100.0**	**450 993**	**100.0**	**24 871**	**100**

Source: DBE (2022e).

Table 2: Number of learners, educators & schools in public and independent schools, by province, 2022

| Province | Public | | | Independent | | |
	Learners	Educators	Schools	Learners	Educators	Schools
Eastern Cape	1 751 496	57 509	5 046	74 654	3 895	265
Free State	707 664	23 114	946	21 180	1 229	83
Gauteng	2 254 391	71 966	2 056	357 250	21 487	935
KwaZulu- Natal	2 822 526	91 298	5 801	60 828	4 352	220
Limpopo	1 715 130	50 599	3 646	83 516	3 993	201
Mpumalanga	1 109 466	35 119	1 649	35 821	2 460	135
Northern Cape	299 014	10 127	545	7 042	540	41
Northwest	847 044	27 232	1 448	28 051	1 691	100
Western Cape	1 178 155	38 662	1 452	66 743	5 720	302
National	**12 684 886**	**405 626**	**22 589**	**735 085**	**45 367**	**2 282**

Source: DBE (2022e).

3 PRE-COVID-19 STATUS QUO

The quality of learning in South Africa's basic education system has been a historical concern. Factors such as high learner educator ratios in poor and rural areas; curriculum coverage, learner safety, and the overall effectiveness of teaching and learning have been areas of focus for improvement. This section provides gives an overview of challenges in the schooling sector prior to the COVID-19 pandemic in the schooling sector. These include the growth in learner numbers, the large cohort of teachers who are nearing retirement and constraints in provincial allocations to education budgets, and the rapidly changing demands on the curriculum of the 4IR – while some schools had access to technology and digital resources, others faced limitations due to budget constraints or lack of infrastructure. Moloi et al. (2021) noted a rural-urban digital divide where rural schools lack computing infrastructure and teacher training.

3.1. The State of the Subsector Pre-COVID-19

This brief overview of the state of schooling sector draws on recent published analyses of both the provision of education resources and the quality of teaching and learning (Arlington, 2021; DBE, 2022a, 2022d; Soudien et al, 2022). It is posited that the state of schooling pre-COVID-19 had improved both in terms of resource inputs and in the quality of teaching and learning as measured by the Trends in International Mathematics and Science Study (TIMSS). Although severe challenges still exist with many schools and learners still vulnerable to the legacy of apartheid education and the impact of socio-economic inequality as noted by Soudien et al. (2022).

> "The majority system is beset by all the challenges that come with racialized inequality: inefficiencies, teacher shortages in key subjects and poor school climate and discipline. Although school infrastructure and resources have improved over the last 25 years, some learners still attend schools which have poor infrastructure and dilapidated buildings, dangerous and unsanitary pit latrines, issues with water supply, ill-equipped teachers, shortages of learning materials, large classes, and high dropout rates… From TIMSS 2003 TIMMS 2019, the mathematics achievement improved by

102 TIMSS points or one standard deviation. The gains were largely due to post-apartheid's most significant drivers of social change, improved home and school conditions effected through a combination of social welfare interventions and socio-economic factors, the provision of social grants, school nutrition schemes and fee-subsidies, improved school resources and instructional materials, increased proficiency in the language of the assessment, improved teacher knowledge, increased levels of parental education, and a greater focus on what happened inside schools and classrooms." (Soudien et al., p. 307-308).

3.2. The State of Teacher Demand, Supply, and Skills Development

Teacher skills development takes place in the national context of weak economic growth and low employment rates. Spaull (2022) and Gustafsson (2022b) found, through their research on teacher supply and demand, that there are no factors compelling larger numbers of educators to transition from the schooling sector to the private sector. However, it is impossible to predict developments in the wider economy over the short to medium term that might affect teacher supply in relation to the private sector. Severe constraints on government spending were a factor prior to COVID-19 and with the redirection of government revenue during and post COVID-19 towards expanding spending on social safety nets and to COVID-19 protection measures. As a result, increased spending on teacher supply to schools has been under severe pressure with learner educator ratios rising in most provinces since 2016 (Spaull, 2022).

Teacher supply from higher education institutions has not been adversely affected by the impact of COVID-19 and registration in education degrees appears to have increased slightly over the past two years – possibly due to the greater number of SCE bachelors level passes (Gustafsson, 2022b). While concern for the quality of teacher education delivered at tertiary institutions remains (Roberts & Moloi, 2022), there remains a dearth of studies that point to COVID-specific impacts on the quality of teacher education at higher education institutions.

Recent publications produced as part of the ongoing Teacher Demographic Dividend Project highlight important findings relevant to teacher demand. Modelling by Gustafsson (2022b)

highlights three of the main drivers of teacher demand over the next 10 years. Firstly, the number of learners is projected to increase by a total of 5.6% between 2021 and 2030. Secondly, the age profile of the current stock of teachers shows that 49% are over the age of 50 and will be retiring in the next few years. In 2021 there were approximately 24 000 teachers leaving the school sector, of which just under 12 500 teachers were aged 55+ and presumably retiring. Retirements are projected to increase to almost 17 300 by 2029. The third issue of major concern for educator demand (and supply) are the reductions in annual hiring of educators as provinces' budgets become increasingly constrained (Van der Berg & Gustafsson, 2022).

3.2.1. Teacher Demand

Gustafsson (2022b) highlights three of the main drivers of teacher demand over the next 10 years. Firstly, the number of learners is projected to increase by a total of 5.6% between 2021 and 2030. Secondly, the age profile of the current stock of teachers shows that 49% are over the age of 50 and will be retiring in the next few years. In 2021, there were approximately 24 000 teachers leaving the school sector, of which just under 12 500 teachers were aged 55+ and presumably retiring. Retirements are projected to increase to almost 17 300 in 2029. The third issue of major concern for educator demand (and supply) are the reductions in annual hiring of educators as provinces' budgets become increasingly constrained (Van der Berg & Gustafsson, 2022).

Spaull (2022) looks in detail at the projected demand for new educators under three scenarios. The first scenario is one where the total headcount of teachers remains the same and increases in the need for new appointees are driven by increases in the number of teachers retiring. The second scenario projected growth in the number of school-going children and the current increases in the retention of leaners to Grade 12. The third scenario includes the assumptions in scenario 2 but increases the number of new teachers that need to be hired if provinces are to drop their learner educator ratios back to 27:1 by 2030.

For each of the three scenarios, Figure 1 shows the number of new educators needed by the school system by 2040. Note the baseline appointment in 2021 of 24 456 new educators. The

sharp drop in the number of new teachers needed in 2030 is precipitated by both the population of 7-to-18-year-olds levelling off and the annual number of teachers retiring beginning to decline. The projections do not include external factors that may affect the supply and demand of teachers, such as changes in the composition of the workforce that may draw teachers out of schools.

Figure 1: Number of teachers required to join the public schooling sector under different scenarios 2021-2040.
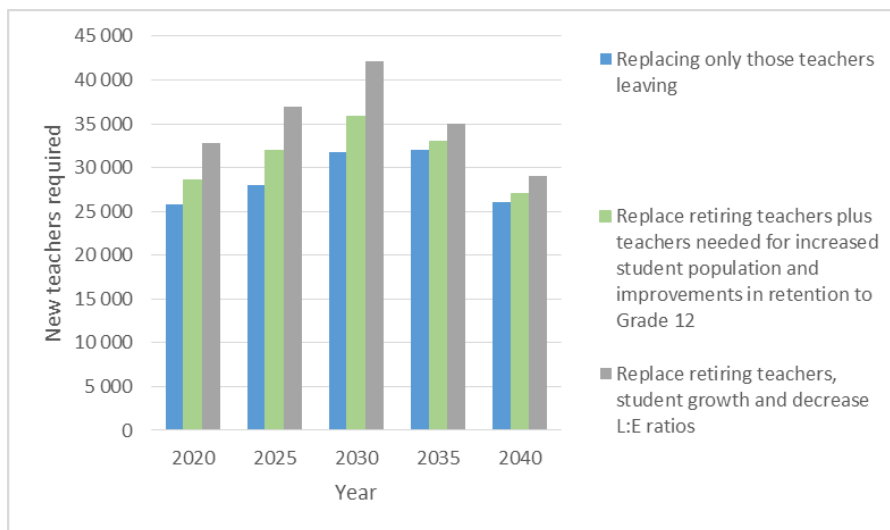
Source: Spaull (2022)

3.2.2. Teacher Supply

The pre-service training of teachers at the higher education institutions (HEIs) has grown as requested by the DBE and the Minister of Higher Education and Training in 2016 (ETDP SETA, 2021) and the total enrolment of BEd and PGCE students has risen to over 200 000 across residential and distance courses in both the public and private HEIs. However, annual employment of new teachers by the PDEs has only absorbed about half of all graduates.

Figure 2 shows the relative contribution by the various HEIs of recently graduated teachers entering employment in the public school system.

Figure 2: The relative contribution of universities to training teachers who go on to be employed in public schools in South Africa
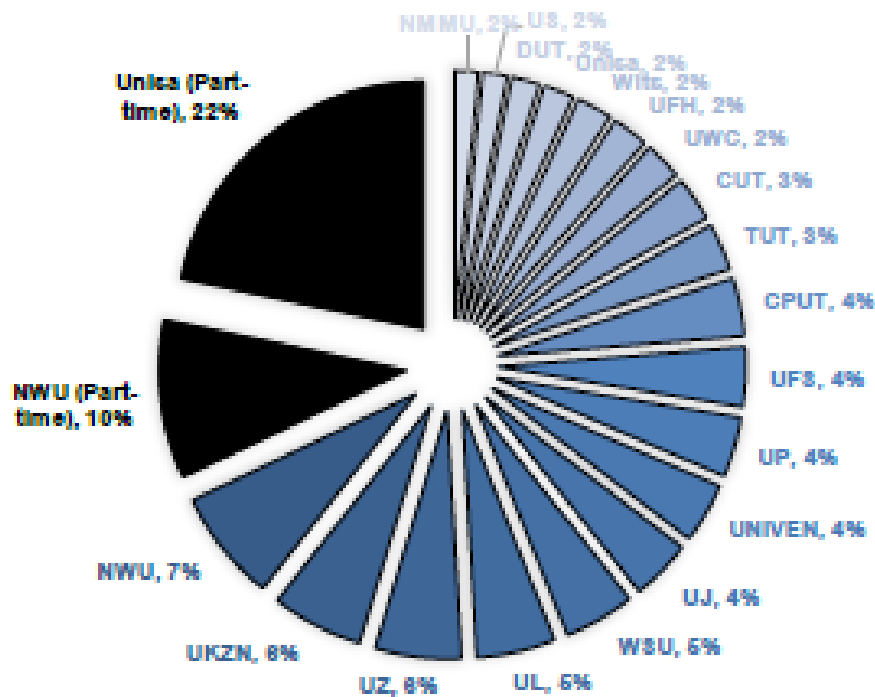
Source: Spaull and Ntaka (2022)

Further work needs to be done on understanding the uptake of teachers into the public education system, which education level teachers and what specialisations are produced by the various HEI's.

3.2.3. Skills, Occupational Shortages and Hard-to-Fill Vacancies

The concerns around teacher skills shortages and hard-to-fill vacancies existed before the COVID-19 pandemic. While there has been a reported oversupply of teachers, the shortages have been for those who specialised in scarce and critical skills and learning areas, and this was worsened for educator supply in rural areas. The annual employment of new teachers only absorbed half of all graduates (ETDP SETA, 2021) in large part due to budget constraints faced by the country as a whole and in part due to the speed with which the HEDs increased their teacher training capacity. Unfortunately, Covid-19 budget reprioritization led to further reductions in annual hiring of educators at provincial level (Spaull, 2022).

While there has been limited professional development for blended or online teaching the schooling sub-sector has been expected to increase the number of teachers with more focused skillsets such as coding, robotics, and data analytics (Chirinda et al., 2021). Gauteng DBE identified Technology (Programming and Robotics) and ICT integration as some of the Professional, Vocational, Technical and Academic Learning (PIVOTAL) training programmes which would need to be prioritised.

Teachers at the FET phase schools (Grades 10–12) are in high demand, especially those with a focus on math, physical sciences and languages. The integration of new educational technology is also one of the reasons behind hard to fill vacancies such as CAT and Geography (ETDP SETA, 2022b). However, teacher shortages also exist in Afrikaans and African Languages and more than 900 social science teaching vacancies have not been filled due to lack of qualifications (ETDP SETA, 2022b; Siebritz, 2022). Particularly affected are rural provinces where there is limited availability of teachers with scarce skills, many of whom migrate to urban areas and arising thereof low-quality teaching in these subjects persists in rural areas (Muremela et al., 2023).

4   POST-COVID-19 STATUS QUO

The impact of COVID-19 on the schooling sub-sector was significant with the large numbers of days of learning lost in 2020 and the consequences arising thereof as evidenced in updated learner enrolment and retention data and the actual learning losses as measured by pre- and post-COVID-19 testing of early grade skills (Ardington et al., 2021) and an analysis of the systemic evaluations in the Western Cape (Van der Berg et al., 2022). It is acknowledged that the pandemic may have both directly and indirectly affected the way skills are imparted and acquired.

4.1.   School Days Lost Due to COVID-19 Closures and Social Distancing Requirements

In terms of understanding the impact of COVID-19 on learning achievement in the early grades the work of Ardington et al. (2021) who conducted a large-scale statistical analysis of Grade 4 reading tests conducted in 2019 and 2021; and Van der Berg et al. (2022) who analysed the difference in performance in the Grade 3, 6 and 9 systemic tests in the Western Cape are revealing.

After the initial closure of schools for 10 weeks between the 23 March and the 8 June 2020, the number of days of schooling lost varied between grades as learners returned to schools in a phased process. Grades 5 and 8 learners only returned to school in August 2020 and only attended 58% of the school calendar (Hoadley, 2020). Table 3 below shows the percentage of the school calendar that was available for instruction in 2020 for each grade. However, learning days were further reduced by the early directive from the DBE for schools to operate at no more than 50% capacity and rotate teaching days. Additional learning time would have also been lost by schools needing to close for cleaning due to infected staff or students (Hoadley, 2020).

Table 3: Number of school days available for instruction in 2020

Grade (in order of staggered return to school)	Total school days available in 2020	2020 school days as a percentage of pre-COVID-19 calendar (204 days)
Grade 12	141	100%*
Grade 7	168	82%
Grades R, 1, 2, 3, 6, 10, 11	139	68%
Grades 4 and 9	124	61%
Grades 5 and 8	119	58%

Source: Hoadley (2020, p. 4)

* Calculated as a percentage of the number of instruction days for Grade 12 in 2019 which was 138.

Further learning days were lost in 2021 due to delays in starting the school year and, until August 2021, with many schools continuing to rotate teaching of grades on alternate days or weeks depending on how many learner's schools could accommodate with the requisite social distancing. Gustafsson's (2022a) analysis of the 2021 Term 3 administrative data on attendance suggested that approximately 22% of contact time was lost nationally during that term. However, in schools where rotational teaching was still being implemented, the amount of lost contact time was as high as 50%. The 2022 school year also saw teaching days lost due to COVID-19 closures. The upsurge in cases in December 2021, necessitated the 2022 school year starting almost a month later than usual on the 7 February (DBE, 2022a).

The number of school days lost was greater in poorer schools as they were less likely to have space to accommodate students with sufficient social distancing and would have continued with students rotating for longer (Gustafsson, 2022a). In addition, rural schools may have struggled with delays in PPE, cleaning materials and a lack of access to water (Hoadley, 2020). Bisgard et al (2022), in a study into the impact of COVID-19 on the sample of rural primary schools in the Northwest Province, found that Grade 3 learners lost, on average 56% of contact school days in 2020 and Grade 7 learners lost 49% of contact school days. The study estimates that in 2021 school closures and rotational teaching meant that Grade 3 learners lost on average 36% of school days and Grade 7 learners lost 34%.

4.1.1. Estimates of Learning Losses

Evidence suggests that by the end of 2021, the average Grade 4 learner could read as well as the average Grade 3 learner before the pandemic. This means that children have lost the equivalent of a full year's worth of learning" (DBE, 2022b).

Analysis of learner test results from two important quantitative studies conducted pre- and post-COVID-19, Ardington et al. (2021) from three early grade reading projects and Van der Berg et al. (2022) which compared the results of the 2019 and 2021 Western Cape Systemic Tests. The Ardington et al. (2021) study looked at learning losses in home language as well as second language English and pooled reading test results from the final term of 2019 and compared these to test results from three early grade reading sites. The sample schools fell into quintile 1 – 3 located in urban, peri-urban and rural schools in the Eastern Cape and in rural areas of KwaZulu Natal and Mpumalanga. Test results of Grade 2 and 4 learners from pre- and post-COVID-19 were compared to test results of Grade 2 and 4 students in 2018 and 2019 to assess learning progress with and without the COVID disruption. The Grade 2 and 4 learners affected by COVID-19 attended on average 40% and 44% respectively of the normal school year as over 80% of schools in the study were implementing some form of rotational scheduling. The test results show that in terms of home language reading Grade 2 learners in 2020 only gained 30% of what their peers gained between 2018 and 2019. Grade 4 learners in 2020 only gained between 19% and 38% of reading in both home language and second language English compared to their pre-pandemic peers (Ardington et al., 2021).

The comparison of the 2019 and 2021 Western Cape grade three, six and nine systemic test results showed learning losses (as calculated by the average scores) across all grades in language and mathematics (Van der Berg et al., 2022). Figure 3 illustrates the performance in the Western Cape systemic tests (2019 and 2021). Learning losses were greater for all grades for mathematics compared to language. Grade 3 learners scored an average of 42% in languages pre-pandemic and 39% post-pandemic, while in maths they scored 60% pre-pandemic and 51% post-pandemic. Grade 9 learners had the lowest difference in scores between the pre- and post-pandemic groups with an average score of 59% and 56% for languages respectively and 38% and 32% for maths respectively.

Figure 3 : Performance in the Western Cape systemic tests (2019 and 2021).
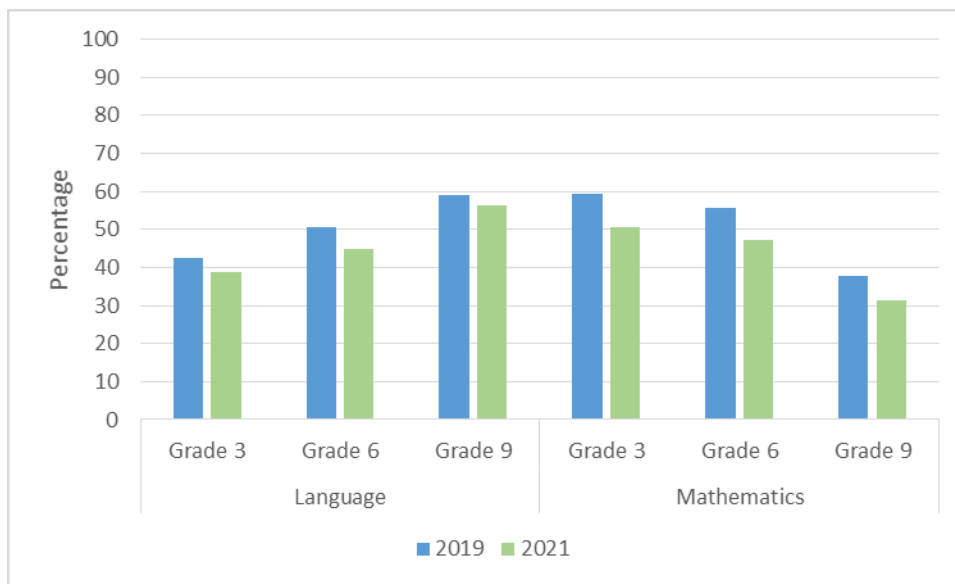
Source: Van der Berg et al. (2022).

4.2. School Enrolment and Retention

Understandable concern was voiced over the possible longer-term impact of COVID-19 on learner enrolment (DBE, 2022b; Gustafsson, 2022b). It was feared that disruptions to schooling would lead to particularly vulnerable learners dropping out permanently. Early indications from the National Income Dynamics Study – Coronavirus Rapid Mobile Survey (NIDS-CRAM) studies were pointing to increased household poverty, hunger, worsening health outcomes and the loss of household members could lead to as many as 900 000 learners dropping out of the school system (Van der Berg & Spaull, 2020). Fortunately, this did not transpire with a combination of emergency poverty interventions from government including access to school feeding schemes which appear to have mitigated massive and permanent dropouts from the school system. Dropout from later grades may have been mitigated by the COVID-19 related unemployment which had the biggest impact on young workers (World Bank/IMF, 2020).

This is confirmed by Statistics South Africa (StatsSA) 2020 General Household Survey which showed that the most affected children were five-year-olds where 38% were out-of-school, followed by six-year-olds where 11% were out of school (StatsSA, 2022). **Error! Reference source not found.** shows the out of school children aged 5-13 years as a percentage of total

children by age 2016 to 202 and **Error! Reference source not found.** shows the out of school children aged 14-18 years as a percentage of total children by age, 2016 to 2020. The 14–18-year-old cohort saw fewer out of school youth than in previous years.

Figure 4: Out of school children aged 5-13 years as a percentage of total children by age, 2016 to 2020

	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13
2020	37,7	11,8	3,5	2,4	2,4	2,1	2,3	2,4	2,5
2019	10,9	3,5	1,9	1,4	1,0	0,7	0,5	1,1	1,5
2018	14,6	2,7	1,1	0,9	0,3	1,3	0,5	0,8	1,0
2017	12,0	3,4	1,0	0,7	0,8	0,3	0,9	0,5	0,7
2016	11,9	2,9	1,0	1,4	0,5	0,3	0,3	0,4	0,8
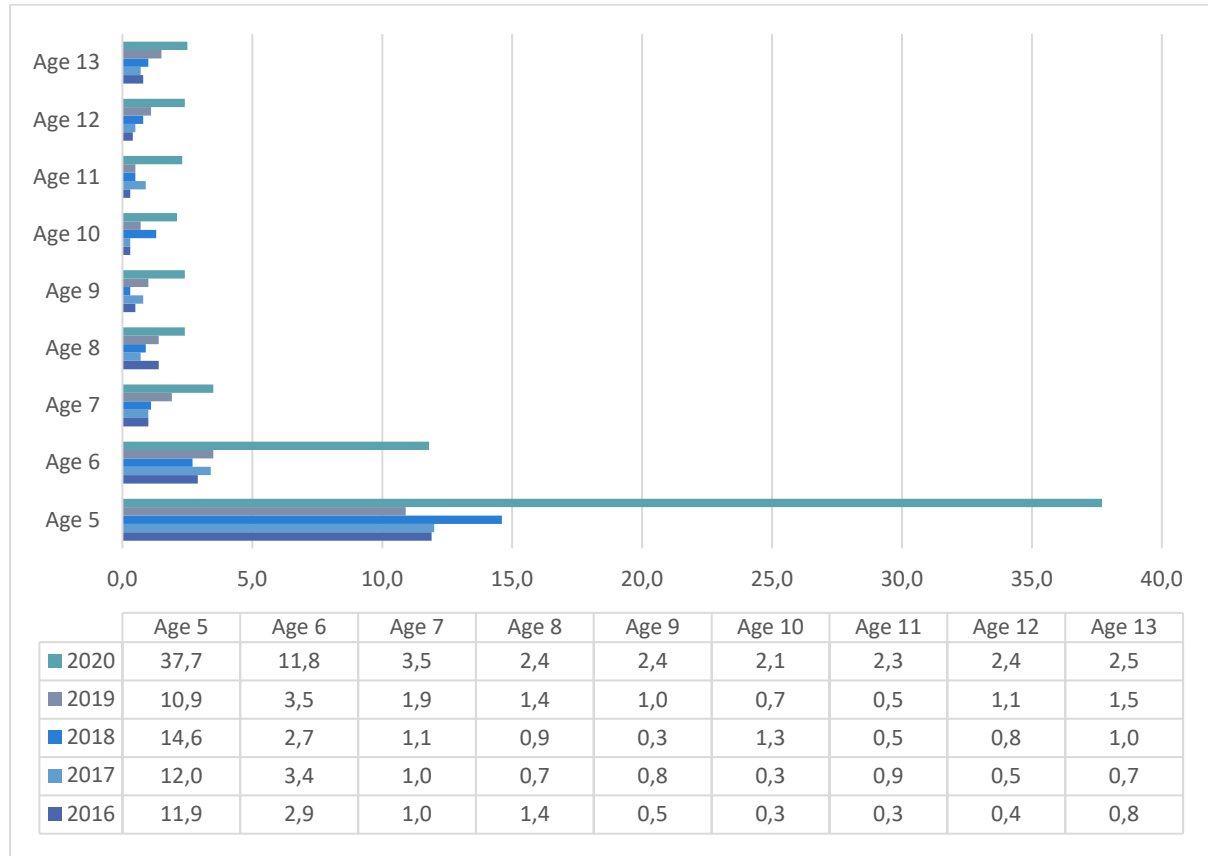
Source: General Household Surveys 2016 to 2020 (StatsSA 2022)

Figure 5: Out of school children aged 14-18 years as a percentage of total children by age, 2016 to 2020

	Age 14	Age 15	Age 16	Age 17	Age 18
2020	3,4	2,3	4,4	6,3	23,8
2019	2,9	2,4	6,5	10,3	25,3
2018	1,1	2,6	4,6	9,8	25,3
2017	1,7	3,1	4,0	11,4	27,8
2016	2,0	4,5	6,5	13,7	27,7
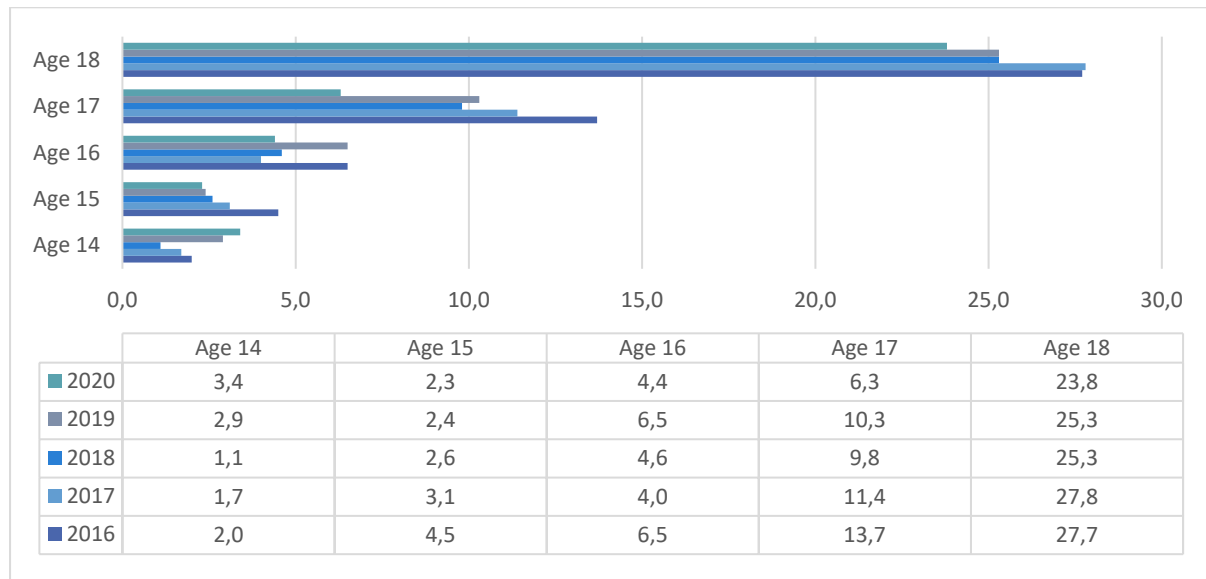
Source: General Household Surveys 2016 to 2020 (StatsSA. 2022)

The latest estimates of school enrolment and retention conducted for the DBE (Gustafsson, 2022b) found that relatively few learners left the system permanently and the minor decrease in enrolment between 2020 and 2022 was due to delayed start of younger children in Grade R and Grade 1. In fact, the number of learners in the school system has continued to increase at the same rate as before the COVID-19 pandemic.

Figure 6 shows the population estimates of 7- to 18-year-olds in South Africa which is mirrored by the enrolment in Grades 1 to 12 from 2016 onwards. Gustafsson (2022b) compared enrolment microdata from Term 1 of 2020 with that of Term 1 of 2021 and found that "secondary level retention improved considerably". Changes in the evaluation process throughout the school system precipitated greater progression between grades – especially from Grades 9 to 11. It has also meant that the number of learners who would normally exit school before Grade 12 had decreased. The number of repeaters – particularly in Grade 9 – have declined and the total enrolment in secondary school has increased. In addition, the number of SCE candidates in 2021 was the largest ever with around 705 000 full-time candidates writing the exam. Gustafsson (2022b) argues that these increases were largely due to changes in the pandemic-related changes to rules which allowed more Grade 11 learners in 2020 to be promoted to Grade 12.

Figure 6: Child population estimates (2000-2030) and Grade 1 to 12 learner enrolments (2000-2021) in public and private schools.
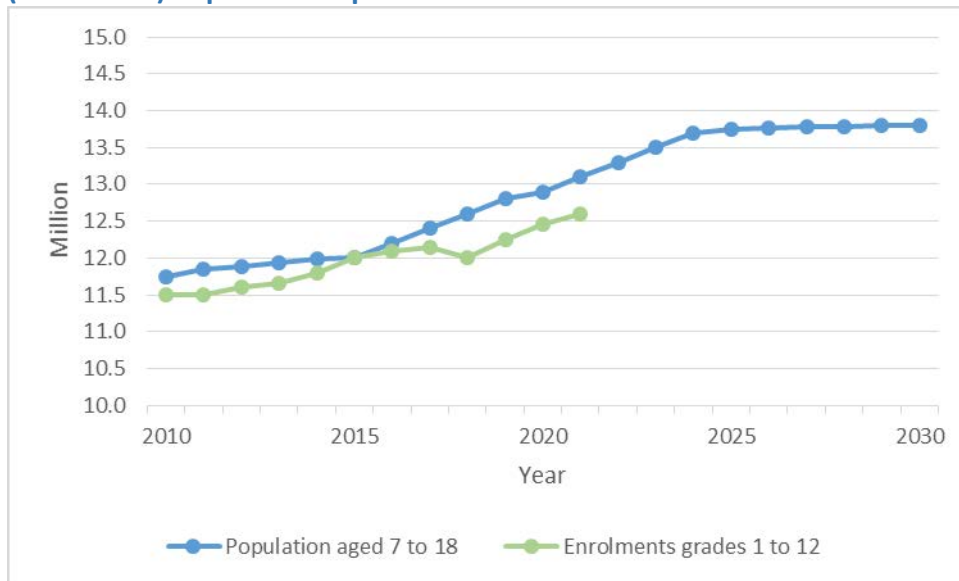
Source: Spaull (2022).

4.3. The State of the Subsector Post-COVID-19 and Emerging Trends Impacting on the ETD Sector

The ripple effects of the pandemic led to numerous changes in organisational and educational structures. This section is aimed at documenting how the ETD sectors have adapted and evolved in response to the crisis.

4.4. Access to ICTs and Remote Learning

Several analysts have commented on the inequality of access to the internet as one of the drivers exacerbating educational inequality during the COVID-19 related school closures and subsequent rotational learning (StatsSA, 2022; Soudien et al., 2021; Vale & Graven, 2021). Table 4 shows detailed analysis on the digital technology available in 2020 in households with individuals aged 5 to 24 years old (StatsSA, 2022). Thirty-three percent (33%) of the households with 5- to 24-year-olds residing in them are in rural areas. The majority of in households in income Quintile 1 and Quintile 2 have 5- to 24-year-olds living in them – 60% and 80% respectively, while 35% of Quintile 5 households had 5- to 24-year-olds living in them.

In terms of access to online learning only 12% of 5- to 24-year-olds were offered remote online learning. However, the weighted average of only those attending Grades 1 to 12 suggests that 20% of school going learners were offered some sort of remote online learning. The predominant access to the internet is via smartphones – 67% of households and 58% of individuals aged 5-24 had access to the internet via a smartphone. 73% of 5- to 24-year-olds living in metros and urban areas had access to the internet via a smartphone while only 28% of rural 5- to 24-year-olds had access. It is not entirely clear how many school going children had access to the internet via smartphones, but the survey shows that 30% of Grade 7 learners had a cell phone and 80% of Grade 12 learners had a cell phone.

Table 4: Percentage of households with 5- to 24-year-olds that have access to leaning technology (2020)

Access to	Total (%)	Urban/Metro (%)	Rural (%)	Quintile 1 (%)	Quintile 5 (%)
Percentage of households with 5- to 24-year-olds	60	67%	33%	60 (Quintile 2 80%)	35
Percentage of 5- to 24-year-olds attending an educational institution*	71 (pre-school or school) 4.5 (post school)				
Percentage of all those attending educational institutions who are in Grade R to 12	91				
Percentage of 5 - 24-year-olds offered remote learning**	12 (20% of those attending Grade 1 to 12)	15	8		
TV	91		86	82	99
Paid TV	66		58	42	93
Computer	25% households and 32% of individuals 5 to 24	44	10	8	79
Cell phone	91				
Internet at home	7	13 (Metro) 5.3 (Urban)	0.6	8.5	57

Access to	Total (%)	Urban/Metro (%)	Rural (%)	Quintile 1 (%)	Quintile 5 (%)
Access internet via smart phone (households with 5 to 24)	67		57	20	15
Access to internet via smart phone (5- to 24-year-olds only)	58	73	28		
Access internet at work	16			1.4	48
Access internet in public facilities	13 households (12% of individuals 5 to 24)		3.9 (2.6 of individuals 5 to 24)	15	19
Grade 7 learners with access to a mobile phone	30				
Grade 12 learners with access to a mobile phone	82				

* Attendance not COIVD-19 related – includes all 2020 registrations
** Includes university students and those not attending an educational institution
Source: StatsSA (2022).

The constraints in learners' and teachers access to the internet precluded online learning for most learners while schools were closed. But even when teachers were able to return to the school premises the lack of learning technology and internet connectivity at schools excluded most teachers from the online resources that may have been available to them. The DBE's National Education Infrastructure Management System Report 2021 (DBE, 2022c) states that only 20% of schools have access to internet connectivity for teaching and learning and only 30% have access to internet for administrative purposes[1]. While 94% of schools can access cell networks, the constraints around learners' access to learning technology ultimately determined that no learning was able to take place between schools and learners except via WhatsApp messages, as discussed above. Schools that were able to offer classes online and whose pupils had access to the internet were able to continue teaching (or at least provide

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[1] This figure is much lower than the DBE's *2017/2018 School Monitoring Survey: Technical Report* which found that 65% of schools have access to the internet in 2017 (DBE 2018a).

learners with links to lessons sourced elsewhere such as Khan Academy) within a relatively short space of time (Dube, 2020).

Research conducted for the ETDP SETA by Moloi and Mhlanga (2021) who interviewed 145 school principals from urban and rural schools as well as public and private schools on the availability of the basic features needed to drive the 4IR in their schools. The study found that in terms of technology used in schools for teaching and learning 88% of schools had computers, 45% of schools had projectors and 46% had Wifi and 34% had smartboards. Some urban schools had introduced licenced platforms for teaching and learning such as MS Teams (3%), used WhatsApp or other Google aps (15%) and YouTube (9%). No rural schools used these ITC for teaching due to connectivity and electricity challenges and 39% of principals indicated that their staff were moderately competent to competent in using the existing ICT at their schools, while 23% reported that their staff were not competent at all. Given that these are the levels of competency for the actual ICT equipment at school, levels of competency for comprehensive ICT in schools would be much lower. In this regard formal training in the utilisation of technology was extremely low (approximately 10%). However, 90% of respondents replied that training was "not applicable". In terms of the challenges with introducing technology for teaching and learning, 68% of principals stated that a lack of funding was a problem and 31% of principals stated that the inability to get support from service providers or a shortage of skilled personnel at schools was a problem (Moloi & Mhlanga, 2021).

A United States Agency for International Development and DBE analysis into the impact of COVID-19 on the sample of rural primary schools in the Northwest province was conducted by Bisgard et al. (2022). Data was collected from 225 rural primary schools and included interviews with district officials, principals, teachers, caregivers and learners. All district officials interviewed stated that they lacked the devices and internet connectivity to support schools. They were not allocated data by the PDE nor were they able to pint additional material to support teachers. Neither teachers nor caregivers felt that increased access to digital communication would be useful in supporting teaching and learning with only 4% of the teachers interviewed and only 3% of the 1 925 care caregivers interviewed stating that it

would be useful. However, 21% of teachers stated that they would like training in online teaching (Bisgard et al., 2022).

Chirinda et al. (2021) interviewed 23 Grade 12 mathematics teachers in urban township and informal settlement schools on their experiences of emergency remote teaching (ERT) during the COIVD-19 lockdown. The study finds that prior to the COVID-19 related school closures, teachers had limited professional development for blended or online teaching. During school closures most of the teachers interviewed by Chirinda et al. (2021) explored a variety of platforms for "live" online classes – mostly composed of videotaping themselves teaching and forwarding the files via WhatsApp to learners. Some experimented with YouTube, annotated PowerPoint slides and Facebook live. However, it was immediately apparent that learners did not have sufficient data to download the material. Most teachers integrated the COVID-19 learner support TV and radio into their teaching (which they had not done prior to the COVID-19 related school closures). Teachers mostly used WhatsApp messages (but not video chats) for their teaching platform, set work to be done and responded to learner's queries. However, even with this low data technology teachers did not have sufficient data (and were not provided any by their schools). In addition, some learners did not have access to smart phones and teachers became increasingly stressed by the inability of some of their learners not being able to participate in even this limited support (Chirinda et al., 2021).

4.5. Ongoing Utilisation and Expansion of Education Technology Including DBE Initiatives Impacting on ETD with Respect to the 4IR

The need for rapid provision of emergency remote teaching during school closures and limitations on attendance during COVID-19 has highlighted the urgency of ensuring that educational technology and online learning materials are available to all schools, teachers, and learners. Use of educational technology is certainly an important aspect of schools' ability to respond to the demands of the 4IR and DBE and partners have, in response to the National Plan, been developing extensive reforms to education system to prepare students for the world of work in an increasingly technological era. In 2017 the DBE announced plans to implement a General Education Certificate for Grade 9, a Three Stream Model for secondary

schools, Focus Schools and changes to the curriculum to include robotics and programming as well as the addition of new technical subjects at the FET level (DBE, 2020).

The DBE's Action Plan to 2024 (2020) calls for the:

> "Immediate implementation of a curriculum with skills and competencies for a changing world, with the emphasis being on the Three Stream Model, entrepreneurship education, focus schools, coding and robotics, and the implications of the Fourth Industrial Revolution" (DBE, 2020, p. iv).

4.6. Information and Communication Technologies in Schools

The lack of access by schools to ICTs for teaching and learning and the gap in teacher's skills for using ITCs was outlined in an earlier section. The provision of ICTs for teaching and learning in schools is a complex task and, yet, the DBE has not outlined in detail how this will be undertaken. If the figure of only 20% of schools being equipped with ICTs for teaching and learning is correct, it means that nearly 19 000 schools need equipment, broad band internet connections and teacher training. Larger schools will need dedicated staff to manage the ICTs and smaller schools with need readily available access to support services of some sort. While the need for physical infrastructure, teacher training and ICT support staff is an over-simplified description of the requirements, it does begin to illuminate the size of the undertaking. Potentially 300 000 teachers will need training and more than 10 000 ICT support staff will need to be appointed.

Resources for workshops and laboratories, ICT equipment and support to 1 000 schools, including 200 technical high schools and 300 primary or feeder schools, will be provided through the mathematics, science and technology grant which was allocated R425 million in the 2022/23 budget (DBE, 2022a).

4.6.1. Coding and Robotics

> "Future careers require people with digital skills that will equip and enable them to function effectively in a digital era. The continued implementation on the teaching of

Coding and Robotics will equip and expose learners to digital literacy, virtual reality, augmented reality, machine learning, artificial intelligence and the Internet of Things" DBE Annual Performance Plan 22/23 (2022, p.7).

Piloting and implementing the Coding and Robotics Curriculum is currently underway. The subject has been implemented in Grades R, 1 and 2 and full-scale implementation of Grade 3 and Grade 7 took place during the 2023 academic year. Implementation of Grade 4-6 and Grade 8 will be in 2024 and Grade 9 will be in 2025. The current implementation is focussed on upskilling teachers to teach this new subject. No reviews are available on the implementation of Grades R to 2 or the ETD that has taken place.

4.6.2. Presidential Youth Employment Initiative

The Presidential Youth Employment Initiative (PYEI) is part of the Presidential Employment Stimulus (PES) and was implemented in Dec 2020 to offer unemployed youth the opportunity to gain work experience and training. Young people would have the opportunity to work for three months in schools as educational assistants and general school assistants and training would be offered in ICT and building maintenance. Between December 2020 and April 2021 phase one of the PYEI saw over 300 000 young people appointed as education assistants and general school assistants. Phases two and three were implemented in 2021 and 2023. More than 850 000 young people were given a three-month placements and training opportunities. Phase 4 of the PYEI facilitated 255 000 places in schools at the beginning of 2024. An orientation course is offered on the DBE internet platform E-Cubed, and a digital literacy skills course is offered free of charge through the National Electronic Media Institute of South Africa (NEMISA).

4.6.3. Occupational and Vocationally oriented subjects, Three Stream Schools and Focus Schools.

While a substantial amount of preparatory work has been done for all three of these priorities, the ETD requirements are years away from being finalised. Some new occupational and vocational subjects have been implemented – such as Marine Sciences – but many subjects

will take some years to roll out. The new subjects were submitted to Umalusi for appraisal and quality assurance in 2021. According to the Minister of Basic Educations budget speech (DBE, 2022d) learner books, teacher guides and training manuals had been developed in preparation for the training of subject advisors and teachers. Currently there is very little information available on the roll-out of these subjects or the impact on ETD. Similarly, the ETD requirements for the Three Stream Model (TSM) and Focus Schools are several years away from being developed. The intention is that all public schools will be able to offer opportunities for learners who do not want to pursue an academic stream and inclusion of occupational and vocational streams has been proposed (DBE, 2020). While the TSM has been a priority for implementation for over five years, very little information exists on the plans and timeframes for this. In 2022 the DBE and the NECT (2022) advertised for a service provider to develop a strategy for the implementation of the TSM. This strategy would include "a detailed description of the teachers needed", an audit of the current human resources available by subject, projections of human resource requirements and recommendations for teacher development (DBE and NECT, 2022). Given the size of this task, it is unlikely that ETD requirements for the TSM will be available any time soon.

4.7. Coping and Adaptation Strategies within COVID-19

Post-pandemic recovery is a concern for every sector, and ETD is no exception. It is essential not only for immediate recovery but also for ensuring long-term resilience against future disruptions. In this section strategies and approaches that the ETD subsectors are adopting to ensure they uphold and fulfil their mandates in a post-COVID-19 scenario are reviewed.

In response to the need for emergency remote teaching (ERT) the provincial education departments and their partners provided a few additional learning materials for studying from home as well as classes on TV, the radio, and resources on the internet. Study packs and additional learning material were distributed to schools and there appears to have been an upwelling of online content and digital applications produced by the education departments, teachers, NGOs and even learners themselves. That the DBE's provision of ERT was rapid and extensive is not in question, however, concern has been raised by researchers and the DBE itself about the inability of poorer and rural learners to utilise ERT (DBE, 2018a; Soudien et al.,

2021; Moloi & Mhlanga, 2021; Bisgard et al., 2022). Increased poverty, hunger and health concerns exacerbated the difficulty of learning in the home environment and a lack of digital access by teachers and learners meant that online teaching or support was not possible for any of the Quintile 1 to 3 schools (DBE, 2018a). Teachers were working on their own at home for the first eight weeks and had limited connectivity and data (Moloi & Mhlanga, 2021). The DBE and partners may have been making online learning and teacher support available, but it is not clear how much of this that teachers would have been accessing. Soudien et al. (2021) argue that, in an education system already experiencing severe inequality along socio-economic lines, learning losses would be more severe in households lacking:

> "…provisions needed to continue learning from home – such as funds, digital devices and data, adequate nutrition – as well as the disparity in how well teachers, learners and parents have been equipped to do so" (Soudien et al., 2021, p. 320).

4.8. Remote Teaching and Learning Strategies

4.8.1. Department of Basic Education Remote Teaching Platforms and Resources

The Department of Basic Education (DBE) in conjunction with the Provincial Departments of Education (PDEs) put in place a COVID-19 response plan (DBE, 2020). Learning was to continue at home while schools were closed. PEDs were to provide schools with study packs and additional learning material for parents to collect from schools after the hard lockdown was lifted. The DBE also developed the COVID-19 Learner Support programme with lessons broadcast on TV, predominantly for grades R, 10, 11 and 12 and on radio for all grades. Supplementary online or downloadable content was added to the DBE and PDEs' websites and links to NGOs providing on-line content were collated and made available under the COVID-19 Learner Support Programme website.

Further online learning resources were made available via the Tswelopele (www.tswelopele.org.za) and Woza Matrics (www.wozamatrics.co.za) websites. These were developed in 2020 in partnership with the National Education Collaboration Trust and the ETDP SETA. They are both dedicated to accessing online teaching and learning with

Tswelopele focussing on providing links to TV and radio resources for grades 1 to 11 and Woza Matrics being a portal for SCE catch up resources. Both have a presence on other social media platforms.

These DBE COVID-19 Learner Support Programme online learning resources were offered in addition to the DBE's pre-existing online resources – some of which were expanded to include the additional COVID-19 related content and support. This entails at least six separate DBE websites providing online learning materials (education.gov.za; dbecloud.org.za; thutong.doe.gov.za; learn.ecubed-dbe.org, tswelopele.org.za and wozamatrics.co.za); several pre-existing programmes such as Second Chance Matric Programme and Read to Lead; and resources such as "Workbooks", "Thutong" and "Siyavula Resources" and "Mind the Gap Study Guides".

No research could be found assessing, in the COVID-19 context of ETM, the usability of the DBE's, PDEs' or other NGOs' websites or the extent to which the materials available were comprehensive or relevant. Currently, for the purposes of facilitating online learning and support materials in the context of COVID-19, the DBE website is difficult to navigate, often has links that are dead ends or erroneous and is a maze of new and outdated content. The DBE home page is confusing – often referring to content sites by their programme name – such as "Thutong" or technical names such as "LTSM". The dropdown menu for Curriculum>LSMS leads to a dead page last updated in 2015. However, the "LTSM" tag under "Quick links" takes the user, via another route presumably, to a Curriculum>LTSM page which has content but isn't available via the "Curriculum" dropdown menu. The "Workbooks" tag under "Programmes" takes the user to the same place as the "LTSM" tag under "Quick links". While this might not be a problem per se it's likely to be confusing to an outside user looking for resources.

For example, the DBE's COVID-19 support webpage has study material for "Grades 4-12: Siyavula Textbooks" and "Grades 7-9: MST Workbooks". Neither of these labels is particularly useful to a first-time user and essentially the resources are the same, but "textbooks" and "workbooks" have been used interchangeably. Given that these are official DBE textbooks, the link to the Siyavula website is confusing, not least because it takes the user to the

"Siyavula Practice" web page (siyavula.com) which offers learner and teacher support in Grade 8-12 Mathematics and Grade 10-12 Physical Sciences. While the full suite of Grade 4-12 physical science; Grade 10-12 Mathematics; Grade 10 Maths Literacy, Grade 10-12 CAT and IT textbooks is, in fact, available on the "Siyavula" website (www.siyavula.com/read). In the context of limited resources or skills for dealing with websites this is confusing. In any event, the DBE's list of NGO's offering online support is extremely sparse. While NGOs with extensive experience in the online content and teacher development were not included - for example, Funda Wande early grade reading and maths; Olico Maths Education; FunDza Literacy Trust; Mindset; Kutlwanong Centre for Maths, Science and Technology and Read to Rise.

The six separate DBE websites have different content available without any clear rationale and valuable resources such as the Woza Matrics 2023 YouTube channel are advertised on the Woza Matrics website but not on the DBE website. "The Matric Second Chance" page on the DBE website has downloadable video tutorials and audio lessons that may or may not be available on the Woza Matrics website. There is no reference on the DBE website to Woza Matrics other than on the DBE "Matric Second Change" page, and even on this page the Woza Matrics Catch-up Programme is listed under LTSM Resources. Provincial education websites may have a more useable approach to providing supplementary materials, which has not been included in the scope of this review.

4.8.2. Zero-Rated Websites

To address the lack of access to online learning due to the cost of data, the government used the Disaster Management Act to compel cell phone providers to zero-rate a variety of public benefit websites. These included education websites that were pre-approved by the DBE. By early July 2020 thirty sites had been zero-rated (Investec, 2020). This initiative was extended under the awarding of broadband spectrum licences and ultimately 450 websites were zero-rated by the end of 2022 (DBE, 2022a). Currently cell phone providers seem to maintain their own lists of zero-rated websites and generally have a cap on how much data any individual user might utilise in a month. An investigation by Illidge (2022) for the MyBroadband web-based newspaper finds that lists of zero-rated websites were not readily available, several cell

phone providers' links were not working and some of the websites accessed required data. While there may have been direct communication between the education departments and schools about how obtain to zero-rating for the school's website or what zero-rated websites are recommended, there doesn't appear to have been any guidance to the public as to which resources might be best utilised for teaching and learning in various contexts. In fact, the process of having zero-rated website status appears to be arbitrary. For example, MTN's list of zero-rated schools has a total of ten schools and offers no rationale for the inclusion of those schools as opposed to any others (https://www.mtn.co.za/opentime/education/Pages/default.aspx#Schools).

Currently there is no comprehensive research on the utilisation or impact of zero-rated cell phone access – either in terms of the volume of access, the content available, the applicability/useability or the impact on learning. Some information exists on the increase in website utilisation over the COVID-19 related school closures such as Vodacom's E-School access increasing from 40 000 'student events per day' to almost 150 000 by July 2020 (Investec, 2020). Research that has been done on schools, access to digital learning in under-resourced schools make no mention at all of teachers or learners accessing zero-rated web sites for online teaching and learning (Vale & Graven, 2021; Moloi & Mhlanga 2021; Bisgard et al 2022).

Other pre-existing strategies to provide learners with access to free internet such as the 130 Thusong Service Centres, 70 Vodacom sites and Telematics Schools[2] for the SCE Second Chance Programme continued once COVID-19 restrictions were lifted. However, these appear to have been reserved for registered Second Chance users (DBE, 2022b).

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[2] Telematics Schools are a joint project between the University of Stellenbosch and the WCED and have been in operation since 2012. These are physical sites, predominantly in rural areas, where matric students attend 'classes' to access free online materials developed by the Telematics Schools project. Access to the internet has been provided via the Stellenbosch University low-level satellite. Since 2021, the WCED has had a broader collaboration with the University of Stellenbosch Telematics Schools Project to provide data free access to learning materials for grades 10 to 11. https://www.sun.ac.za/english/learning-teaching/learning-teaching-enhancement/learning-technologies/Pages/Telematic-school-project.aspx

In terms of platforms, Whatsapp appears to have had the greatest reach in its pre-COVID-19 utilisation and its lower data costs3 (Vale & Graven, 2021). Communication between schools, parents and learners, as well as learning support from teachers during the COVID-19 pandemic related school closures was predominantly by WhatsApp (Vale & Graven, 2021). Motsepe et al. (2020) also found that during school closures WhatsApp was the most used platform due to its simplicity and familiarity. Several NGOs were able provide learners with enough data to download a small exercise or learning activity daily. The need for resources during school closures also appears to have precipitated the development of WhatsApp chatbots (Metelerkamp, 2022). WhatsApp chatbots are a means to provide information to subscribers via a dedicated WhatsApp phone number. Users are given a menu of options and will then be sent either a file for downloading or content directly on their WhatsApp. Nal'ibali stories (https://nalibali.org/home) for example, present short stories directly onto the phone. Olico Maths Education has a chatbot called Olico Tutor (https://learn.olico.org/) through which users can communicate with an actual tutor. Digify Kitso offers support and resources to teachers (https://digifyafrica.com/tag/kitso/). The FoondaMate chatbots that provide examination papers and study assistance were launched in August 2020 and had 40 000 users in the first month and in 2022 had six million matric papers downloaded (https://foondamate.com/). They now offer support in all official South African languages and has expanded to Nigeria and Indonesia (Metelerkamp, 2022).

The provision of SCE past papers via phone apps were widely used before 2020. Often developed by Grade 12 students for their peers to download resources and past papers, some of these cell phone app developers became commercially successful with substantial footprints (Illidge, 2022). Examples of these are Matric Live (matriclive.com), Don't Fail (dontfail.co.za) and FoondaMate (foondamate.com).

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3 Cell phone providers offer less expensive data packages for WhatsApp. Currently Vodacom charges for R3/50mb for WhatsApp data (https://www.vodacom.co.za/vodacom/terms/promotions/whatsapp-ticket?cid=MG_whts_9_nmp_9927 on 21/03/2023) compared to the smallest standard data bundle at about R12/50mb. Larger bundles are available for R4/50mb but this 1G package costs a total of R80 (https://www.vodacom.co.za/vodacom/shopping/data/prepaid-data on 21/03/2023). MTN WhatsApp data costs R2/50mb (https://www.mtn.co.za/home/terms-and-conditions/content/mtn-prepaid-social-bundles on 21/03/2023) compared to the smallest data bundle which is R10/40mb (https://www.mtn.co.za/Pages/Reduced-bundles.aspx on 21/03/3023).

5   ALLOCATION AND PRIORITISATION OF RESOURCES IN THE SUBSECTOR

Financial stability is crucial for the sustainability of any sector and this section acknowledges the economic strain imposed by the pandemic and to understand the financial the long-term implications of the COVID-19 pandemic and transition to 4IR. Understanding the financial implications will guide the ETD sectors' budgeting, funding, and financial planning in the post-pandemic era.

The Department of Basic Education's Annual Performance Plan 2022/23 (DBE, 2022a) and the Minister of Basic Education's Budget Speech for the 2022/23 financial year outlined several priorities to be funded from the national budget in the forthcoming MTEF period. The focus was on analysis of the national budget for this study and not on provincial budgets and spending. Additional to the DBE MTEF plans would be the allocation of resources to areas prioritised by the ETDP SETA Sector Skills Plan (ETDP SETA, 2021), the Presidential Youth Employment Initiative, the Department of Higher Education and Training and other partners including SACE and NGOs. It is not clear in the budget allocations outlined below where the funding for the roll-out of Focus Schools is provided. The Three-Stream pilot schools will be funded by the EU Budget and the release of first tranche of R19 million was approved by the National Treasury in 2021.

The overall 2022 MTEF budget allocation for the Department of Basic Education is above twenty-nine billion Rands (R29.6 billion), an increase of 4.9% from the 2021/22 overall allocation. Budget items specific to ETD in the school sector are listed below:

- Curriculum Policy Support and Monitoring has been allocated R3.3 billion, a decrease of 2.5% from last year's allocation.
- Teacher Education Human Resource and Institutional Development receive R1.5 billion, an increase of 3.5% from last year's allocation.
- Educational Enrichment Services has been allocated R8.8 billion, an increase of 4.4% from last year's allocation.
- The Mathematics, Science and Technology (MST) Grant has been allocated R424.8 million, a 2.9% increase from last year's allocation.

- Infrastructure delivery – continues to be funded through the Education Infrastructure Grant (EIG), which is allocated R12.4 billion, a 5.6% increase from last year's allocation; and the Accelerated Schools Infrastructure Delivery Initiative (ASIDI), which is allocated R2.4 billion.

- The allocation for the Funza Lushaka Bursary Programme has increased by 1.6% from last year's allocation to R1.329 billion.

- The National Senior Certificate Learner Retention Programme, also known as the Second Chance Programme, is allocated R58.2 million, an increase of 0.6% from last year's allocation.

- The National Education Collaboration Trust (NECT) has been allocated R120.7 million, an increase of 2.6% from last year's allocation.

- Workbooks, including Braille workbooks for visually impaired learners, have been allocated R1.186 billion, an increase of 0.8% from last year's allocation. This amount increases to R1.2 billion, when the Compensation of Employees (CoE) allocation is included.

- The South African Council of Educators (SACE) is allocated a subsidy of R15.5 million, a decrease of 15.8% from last year's allocation.

- Early Grade Reading Assessment (EGRA) has been allocated R11.1 million, an increase of 11.6% from last year's allocation.

- Information Communications Technologies (ICTs) – Operation Phakisa has been allocated R14.2 million which has increased by 27.6% from the 2021/22 allocation.

- The PEYI has had a total budget allocation R13 billion, since the 01st of December 2020 to date.

6 REVIEW OF THE ETD SECTOR SKILLS PLAN

Priorities for the ETDP SETA are outlined in the 2022-2023 ETDP SETA Sector Skills Plan (ETDP SETA, 2021) and are briefly summarised below as they pertain to the schooling sector:

- Ensuring quality of teaching and learning by supporting initiatives and programmes aimed at increasing the number of suitably qualified teachers.
- Ensuring effective and efficient service delivery in public and private educational institutions by improving administration, management, leadership, governance and research capacity.
- Training more female teachers to increase the number of females into principals' positions in the schooling sector.
- Support young people into careers where there's a challenge of an ageing workforce such as ECD, Schooling and Higher Education subsectors.
- Provide support to ETD organisations in dealing with implications of the 4th Industrial Revolution and COVID-19.

In relation to the changing needs for ETD precipitated by the 4IR and the disruptions caused the COVID-19 pandemic, the ETDP SETA Sector Skills Plan (2021) has identified an urgent need to train currently employed educators in the use of ICT for teaching (**Error! Reference source not found.**). It recommends the development of short programmes aimed at addressing the lack of skills and will continue with its involvement in developing these programmes.

In terms of the rollout of the new coding and robotics curriculum the ETDP SETA had, in 2021, contracted service providers and made R7 million available for this training (ETDP SETA, 2021) (**Error! Reference source not found.**) It is not clear what the continued rollout might entail for the ETDP SETA's involvement in this training.

In terms of pre-service training, the ETDP SETA acknowledges that PSET system is struggling to keep up with the changes required by the 4IR and the impact of the COIVD-19 pandemic and will continue research into the demand and supply of emerging occupations and occupations in high demand. While the need for new teachers in maths, science and

technology is likely to increase (**Error! Reference source not found.**) the current number of Funza Lushaka bursary awards for the training of new teachers in is expected to remain at 12 500 learners per year (ETDP SETA, 2021).

Table 5: Sectoral priority occupations

Specialisation/ Alternative title	Intervention planned by the SETA
FET Phase School Teacher (Grades 10-12)	**Skills Programmes** for practicing teachers: Mathematics, English, Science and Technology and ICT Skills short courses
	Bursaries for student teachers in Mathematics, Physical Sciences, Computer Applications Technology (CAT), and Languages
Foundation Phase School Teacher	**Skills Programmes** in Literacy and Numeracy short courses and ICT skills
	Bursaries for B.Ed. students in Literacy and Numeracy
Special Needs Teacher	**Bursaries** for B.Ed. Special Needs Education
Intermediate Phase School Teacher (Grades 4-6)	**Skills Programmes**: Part qualification on subject matter and pedagogy and ICT skills
Senior Phase School Teacher (Grades 7-9)	**Skills Programmes**: Part qualification on subject matter and pedagogy and ICT skills
School Principal	**Skills Programmes**: Management Development Programmes

Source: ETD Sectoral Priority Occupations and Interventions Report 2024-2025

Table 6: Hard to fill vacancies in ETD (2023) (all on 2020 OIHD list)

2021-233107 FET Phase School Teacher Grades 10-12	1351	• Lack of relevant qualifications (630) • Unsuitable job location (566) • Lack of relevant experience (85) • Equity considerations (48)
2021-234102 Intermediate Phase School Teacher Grades 4-6	205	• Lack of relevant experience (27) • Equity considerations (18) • Poor remuneration (14)
2021-233108 Senior Phase School Teacher Grades 7-9	186	• Lack of relevant qualifications (14) • Lack of relevant experience (10)
2021-134501 School Principal	82	• Lack of relevant experience (60) • Lack of relevant qualifications (10)
2021-134507 Departmental Head	42	• Equity considerations (24) • Lack of relevant experience (11)
2021-235201 Special Needs Teacher	41	• Lack of relevant qualifications (26) • Lack of relevant experience (10)
2021-234101 Foundation Phase School Teacher	31	• Lack of relevant qualifications (16) • Unsuitable job location (11)

Source: ETD List of Hard to Fill Vacancies Report 2023

Table 7: Skills gaps identified by ETD (2023)

Managers	2021-134501 School Principal	Leadership & Bus Development, Legislative Compliance, Social Skills
	2021-134507 Departmental Head	Leadership Skills
	2021-143105 Sports Administrator	Count of Safeguarding Children, Supervisory/Team Leader, Team Building
	2021-134504 District Education Manager	Social Skills, Strategic Management Skills
Professionals	2021-233107 FET Phase School Teacher Grades 10-12	Teaching Methodology, Robotics Skills, Digital Skills, Mathematics, Science, Languages, Health and Safety
	2021-234102 Intermediate Phase School Teacher Grades 4-6	Technical Skills, Technology in the Classroom, Occupational Health and Safety, ICT Integration, Coding and Robotics
	2021-234201 Early Childhood Development Practitioner	Legislative Compliance, Technical Skills, Leadership and Bus Development, Performance Management
	2021-233108 Senior Phase School Teacher Grades 7-9	Communication, Time Management Skills, Teaching Methodology, Robotics Skills, Digital Skills, New IEB Systems
	2021-262201 Librarian	Solid Archival Skills, Report Writing Skills, Library ICT Skills
Teaching and Associate Professionals	2021-334302 Personal Assistant	Minute Taking, Social Skills, Written Communication, Emotional Intelligence Skills
	2021-334102 Office Administrator	Technical Skills, Project Management Skills, Excel Skills, Communication
Clerical Support Workers	2021-411101 General Clerk	Advanced Excel, Customer Services, Presentation Skills
Service and Sales Workers	2021-531201 Teachers Aide	Legislative Compliance, Social Skills, Classroom Discipline
	2021-531101 Child Care Worker	Critical Thinking, Legislative Compliance, Leadership and Bus Development

Source: ETD List of Skills Gap Report 2023

7   INFORMATION GAPS

Several areas that require further research have been highlighted in the document, but two areas of overarching concern emerge. The first one is a clearer definition by the DBE of the expected skills needed for the new technology areas – both in terms of individual teachers who will be required to teach and evaluate the subjects and in terms of the expected number of teachers and the timeframe in which they will be needed. The ETD Sector Skills Plan 2022-2023 (ETDP SETA, 2021) has identified several scarce skills that currently exist in the technology fields to which the requirements of the new curriculum should be added as soon as possible.

The second substantial area that requires research is the scope and effectiveness of the technology platforms and on-line teaching and learning materials. In this regard it would be instructive to investigate the number of users (and if possible, their demographic profile) accessing and downloading materials from the various DBE, PEDs, NGOs and commercial enterprises. It would also be instructive to understand more about the extent of the ongoing post-COVID-19 use of technology driven curriculum delivery in schools. In addition, there needs to be a more precise understanding of the training required by teachers to utilise these technology platforms in their teaching.

Gaps in the literature exist around plans by the DBE and PEDs to provide schools with ICT for administration, access to resource materials and provision of technology for teaching. At a minimum, plans would need to include provision of hardware, infrastructure, and software; support staff requirements and training of teachers to utilise the technology.

The newly emerging research on teacher supply and demand raises issues of the financial capacity of the provinces to employ the additional teachers needed to replace retiring teachers and increasing learner numbers. A cost projection of training and deploying teachers qualified in emerging scarce skills areas would be necessary in relation to DBE plans for ICTs in schools and the roll out of new curriculum.

Further research is needed around the quality of teacher training and students' preparation for the requirements of the 4IR, most especially in the distance education mode that supplies over 30% of the new educators employed by the PEDs. While, this topic would be addressed by the higher education and training sub-sector, it does link to another gap in the literature currently available. The career paths of teacher training graduates are a complex topic confounded by skills needs in the broader economy, however, only half of the current graduates are being employed by the PED. Research in this area would be important to shed some light on the employment landscape and the potential broader labour market for 4IR skills that might draw teacher graduates (and incumbent teachers) away from the schooling system.

8 CONCLUSIONS AND RECOMMENDATIONS FOR SKILLS DEVELOPMENT

8.1. Summary of Findings

The purpose of this review was to investigate, in the schooling sub-sector, the structural dynamics in the ETD sector arising from both the pandemic and the technology shifts induced by the 4IR. The paper looked at the available research evidence on learning losses in terms of school days lost from 2020 to 2021 and in terms of the differences in learning achievement on standardised tests. Excluding specific local conditions, in 2020 Grade 12 learners were able to attend the requisite number of school days. Schools were open for Grade 7 learners to attend 82% of pre-Covid-19 school calendar. All other grades only attended between 58% and 68% of the school calendar (Hoadley, 2020). Physical distancing requirements in classrooms meant that learners were rotating for most of 2020 and potentially only attending at school for half the amount of time that schools were open. In 2021, research shows that in Term 3 schools lost 22% of contact time and in schools that were still working on a rotational system learners only attended school for 50% of the term (Gustafsson, 2022a).

In terms of the broader schooling sub-sector landscape the COVID-19 pandemic did not result in increased numbers of learners dropping out of school. The overall number of learners in the system increased according to the expected trajectory given the population growth of 7- to 18-year-olds (Spaull, 2022; Gustafsson, 2022b). However, the internal dynamics of learner progression in grades 10 to 12 saw fewer learners repeating and the number of students writing the SCE increasing in 2021 and 2022 (Gustafsson, 2022b). Approximately 3 000 teachers died due to COVID-19, however, no other COIVD-19 pandemic related labour market issues impacted on the overall number of teachers in public schools (DBE 2022d). The teacher supply and demand issues raised by recent research relate to the ongoing need for teachers due to increasing learner numbers, an increased number of retirements and learner teacher ratios that have been increasing due to provincial budget constraints (Spaull, 2022).

The paper looked in some detail at the impact of COVID-19 on education and training practices, curriculum and pedagogy. Researchers have commented that the DBE

concentrated on digital access at the expense of paper-based interventions (Parker et al, 2020). Given that access of teachers, learners and caregivers to the internet is limited, concentrating on digital access entrenched the already unequal learning opportunities endemic in South Africa (Parker et al., 2020; Soudien et al., 2022). To provide greater digital access to learning materials the DBE and partners negotiated with cell phone providers to offer data free access to approved educational sites and phone applications. While there is no comprehensive research into the number of teachers, learners and caregivers utilising zero-rated sites and cell phone applications there are indications that the volume of traffic rose substantially during the school closures in 2020 and that usage remained high between 2021 and 2022 (DG Murray Trust, 2021). However, relatively large-scale qualitative research on the impact of COVID-19 in rural primary schools makes no mention of teachers and caregivers accessing zero-rated websites or cell phone applications (Bisgard et al., 2022; Moloi & Mhlanga, 2021). Currently, while the cell phone providers still host zero-rated websites and cell phone applications, these are greatly reduced in number, focus on the cell phone providers own applications, are frequently unavailable or not data free for downloads. There is also no comprehensive research into the impact of various online sites in terms of the content, user's ability to navigate the sites or download and use the information – especially in contexts of limited digital literacy. A brief investigation of the DBE's online provision of learning materials finds their websites somewhat opaque, difficult to navigate and inconsistent in their offerings. Provincial education websites may be clearer but were not reviewed. The extent to which the DBE and PDEs informed schools, teachers, and learners directly about the availability of online materials is also not known.

In terms of the DBEs broader response to the demands of the 4IR, several policy documents, strategies and guidelines for improving the use of ICTs in schools have been produced since the "White Paper on e-Education" (DBE, 2004). These are, inter alia, the 2016 NECT document – "The Status of ICT in Education in South Africa and the Way Forward" (Meyer & Gent, 2016) and the Professional Development Framework for Digital Learning (DBE, 2018b) as well as the DBE commissioned guides such as the South African Institute for Distance Education (SAIDE) – "Managing ICTs in South African Schools: A Guide for School Principals" (SAIDE, 2005). It would be important to map which of these documents are still relevant and are being used by the DBE, the ETDP SETA and other partners involved in ETD in the schooling sub-sector.

Several programmes aimed at addressing the demands of the 4IR had been put into place before the COVID-19 pandemic. An overall emphasis on improving the quality of mathematics and literacy in the early grades, including robotics, and coding into the curriculum and increasing access to ICTs for teaching and learning has been seen as essential to the broader demands of an increasingly technical world (DBE, 2020). Updating the secondary school curriculum to include a greater range of technical subjects and eventually transforming secondary schools into offering academic, technical and occupational streams has led to the introduction of several new technical subjects being offered and new subjects being piloted for implementation over the next few years (DBE, 2022d). The COVID-19 pandemic disrupted the piloting of the Three Stream Schools and there is currently no revised timescale for country-wide implementation of new technical subjects at the FET level[4]. In addition, the number of new teachers needed, the skills required or an ETD strategy for teachers in these fields has not been clarified by the DBE. At the basic education level, despite the nearly complete rollout of robotics and coding for Grade R to Grade 9 which includes teacher training, no reviews exist on the extent of implementation or impact of the programme. It is also not clear how many teachers are involved at a school level in the robotics and coding, or which service providers are offering either in-school or online training in this field. The DBE's 2022/23 budget (DBE, 2022b) makes provision for several projects which aim to address specific demands of the 4IR on the schooling sub-sector. These include the Three Stream pilot schools; a maths science and technology grant, ongoing Funza Lusaka bursaries; the NECT workbooks; ICTs, the Presidential Youth Employment Initiative. However, more detailed plans for the broader allocation of the R1.5 billion to the DBE directorate responsible for teacher education and human resource development would need to be obtained from the DBE.

In summary, several areas of further investigation have been suggested but it seems that the major gap is a clear planning framework which includes skills needs and timescales for implementation of ICTs and technology curriculum. There needs to be consistent support in curriculum development. This sector requires a curriculum that prepares students for the

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[4] Implementation of Three Stream Schools had a target for 2024 of 1 007 public ordinary secondary schools offering academic, vocational and occupational subject (DBE, 2022a).

skills and knowledge needed in the digital age and considers special needs. While there are several ETD providers offering courses for professional development[5] in the use of ICTs, it would be important to know the extent to which these will match the demand for technical skills. Currently the DBE does not appear to have detail on the expected skills needed for the new technology areas – both in terms of individual teachers who will be required to teach and evaluate the subjects and in terms of the expected number of teachers and the timeframe in which they will be needed. Furthermore, providing schools with ICTs will need to include additional support staff and training of teachers to utilise the technology. It is a matter of some urgency that planning for ETD is driven by a clearer plans outlining the demand skills in the schooling sub-sector. Additionally, collaboration between schools and industry is crucial for preparing students for the demands of the 4IR. Lastly, within rural areas, there is a need to understand incentives and the reasons teachers choose to work in either rural or urban areas with a view to improving teacher supply to rural areas.

8.2. Recommendations

The recommendations section of this study aims to provide concrete and specific suggestions for future research or practical implementation based on the findings and implications of the study. Overall, the recommendations section serves as a call to action, providing guidance for future research endeavours and practical applications that can build upon the findings of the current study.

1. **Matching Demand and Supply of Educators:**
   - The ETDP SETA can collaborate with Higher Education Institutions (HEIs) to understand teacher production trends and align skills development programs with the needs of the education sector.
   - Intervention: By analyzing data and trends, the SETA can identify areas of educator demand and tailor its training and development programs accordingly.
2. **Understanding Incentives to Teach in Rural Areas:**

- The ETDP SETA can conduct research or partnerships to explore factors influencing teachers' decisions to work in rural areas.
- Intervention: Based on research findings, the SETA can develop incentive programs or training initiatives aimed at attracting educators to underserved rural areas.

3. **Providing Training for Educators:**
- Designing and implementing ICT teaching programs falls within the purview of the ETDP SETA.
- Intervention: The SETA can develop and deliver training programs focused on digital literacy and integration of technology in teaching practices.

4. **Supporting Curriculum Development:**
- Collaboration with stakeholders to contribute to curriculum development aligns with the ETDP SETA's role.
- Intervention: The SETA can provide support and resources to ensure that curricula address the requirements of the Fourth Industrial Revolution and cater to special needs education.

5. **Promoting Partnerships with Industry:**
- Facilitating partnerships between schools and industries is another area where the ETDP SETA can intervene.
- Intervention: The SETA can initiate and facilitate collaborations between educational institutions and industry partners to enhance students' exposure to real-world applications and ensure curriculum relevance.

6. **Addressing the Digital Divide:**
- Collaboration with partners to address the digital divide aligns with the ETDP SETA's objectives.
- Intervention: The SETA can work with stakeholders to provide support to schools in underserved areas, such as improving infrastructure and ensuring access to digital resources, thus reducing disparities in digital learning opportunities.

In summary, the ETDP SETA can play a crucial role in implementing these recommendations by leveraging its resources, partnerships, and expertise to address challenges and enhance the quality and relevance of education and training in South Africa.

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