Journal Background and Scope

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Namibia's Performance in Mathematics and Physical Science: Implications forTechnical Skills

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1. Background

In recent years skill shortages in the labour force have become a key challenge in the SADC region, suggesting that policies for continuous upgrading of skills of the workforce are becoming increasingly important [1]. While Namibia is no exception to the skills shortage dilemma, over the past decade the situation has been worsened by the increased unemployment rates in the country's urban areas, particularly in Windhoek.

Obtaining a junior/senior certificate alone does not guarantee any return to the youth of our country unless accompanied by some technical skills. The curriculum for Namibian Basic Education as set out in "Toward Education for All" [2] includes the following: Aesthetic, social and economic, linguistic and literacy, mathematical, spiritual, moral and ethical, physical, natural scientific and technological learning areas. These, if developed further and applied appropriately to the country's economic situation, should be sufficient to combat the existing skills deficit.

2. The Skills Deficit

According to Marope [3], diverse analyses confirm the acute shortage of skilled labour across all sectors of the economy, and especially in the science- and mathematics-based professions such as engineers, agro- and natural resource specialists, technicians, business administrators, medical doctors, nurses, and mathematics and science teachers in Namibia. Figure 1 shows the skills deficit projections based on data generated by Links [4] for selected natural science and mathematics related professions.

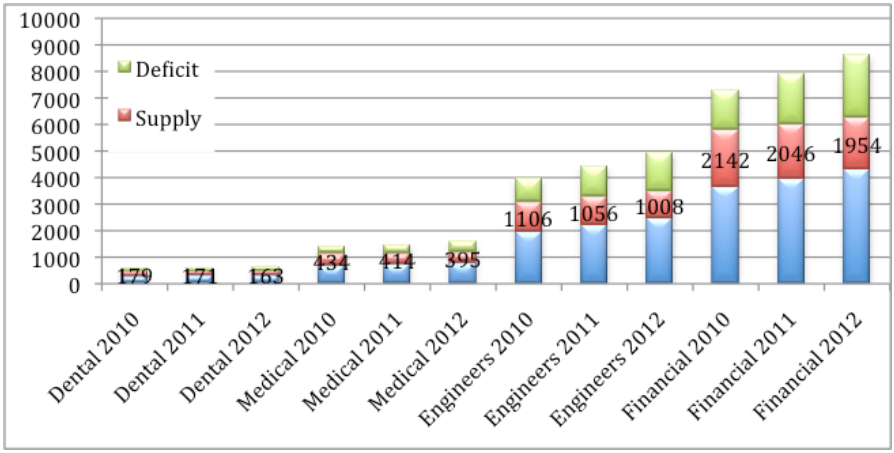


Figure 1: Skills deficit projections

An increase in demand with a decrease in supply, and hence the gradual increase in deficit is evident for all the professions shown in Figure 1. While the Namibian Vision 2030 and NDP4 point to economic competitiveness; technical skills shortage is proving to be a binding constriction to productivity, economic growth, employment creation, and sustainable poverty reduction; which are key to the country's competitiveness in the global economy.

3. The Education System

It is evident that education is acknowledged globally to be the single most important aspect of human development, and a critical success factor for economic advancement and increased equality. The National Planning Commission [5] however, reports that despite significant investment and numerous efforts to strengthen education and skills, the country's education system is still perceived as performing below par. It is therefore not surprising that unemployment, societal inequalities and economic development are identified as key challenges in the NDP4 and hence education remains one of the key strategic focus areas. Some of the key concerns regarding education at present include quality of outcomes at various levels; access to quality early childhood development; vocational training opportunities, and the mismatch between the supply of and demand for skilled labour.

3.1 Initiatives for Improving on Mathematics and Physical Science Performance

The Ministry of Education and Culture's rationale [6] for the mathematics syllabi from grades one to ten is as follows: (1) Mathematics is an essential

element of communication in modern society; (2) Mathematics is essential for every citizen to cope with the everyday operations of number, money, measurement and space; and (3) Mathematics provides a broader insight into the patterns and relationships in the natural and manufacturing world. Projections set for improvement on Mathematics and Physical Science in the period 2005 -2011 are shown in Table 1.

Table 1: Percentage Mathematics and Physical Science Performance (2005 – 2011)

Grade/ Level	Subject	Baseline Grade 10 & 12 2005	Target Value					
			2006	2007	2008	2009	2010	2011
5	Mathematics					47.7	51.2	54.7
	Science					51.6	55.1	58.6
	English					55.9	59.4	62.9
8	Mathematics					47.7	51.2	54.7
	Science					51.6	55.1	58.6
	English					55.9	59.4	62.9
10	Mathematics	36.2	37.2	40.7	44.2	47.7	51.2	54.7
	Science	38.3	41.1	44.6	48.1	51.6	55.1	58.6
	English	45.4	43.0	48.9	52.4	55.9	59.4	62.9
12	Mathematics	32.7	37.2	40.7	44.2	47.7	51.2	54.7
	Science	38.4	41.8	45.3	48.8	52.3	55.8	59.3
	English	31.1	34.6	38.1	41.6	45.1	48.6	52.1

Though the projected improvements in Table 1 seem to be met (Figure 2(a) and (b)), the promising scores in Mathematics shown in Figure 2(a) do not seem to give Namibia the competitive advantage (Table 2) expected.

Table 2: Country Mean Scores for Mathematics and Reading [7]

Country	Reading score		Mathematics score	
	SACMEQ II (2000 to 2004)	SACMEQ III (2006 to 2011)	SACMEQ II (2000 to 2004)	SACMEQ III (2006 to 2011)
Seychelles	582.0	575.0	554.3	551.0
Kenya	546.5	543.1	563.3	557.0
Tanzania	545.9	578.0	522.4	553.0
Mauritius	536.4	573.5	584.6	623.3
Swaziland	529.6	549.0	516.5	541.0
Botswana	521.1	534.6	512.9	520.5
Mozambique	516.7	476.0	530.0	483.8
South Africa	492.3	495.0	486.1	495.0
Lesotho	451.2	467.9	447.2	476.9
Namibia	448.0	497.0	430.9	471.0

Despite efforts to improve on Mathematics and Physical Science performance; the emphasis put on Mathematics, Physical Science and English syllabi; and the performance targets set by the government of Namibia; the country mean mathematics score is still lower than most of the neighboring low population countries (small states of the Commonwealth) like Lesotho, Botswana, Mozambique and Swaziland (Table 2). A similar trend is observed with mean reading scores.

3.2 Initiatives for Improving the Vocational Education and Training (VET)

The vocational education and training (VET) system is implemented with the intention of addressing skills shortages in the country, particularly technical skills at artisan level. The UNESCO Revised Recommendation on Technical and Vocational Education and Training states that: "Given the immense scientific, technological and socio-economic development, either in progress or envisaged, which characterizes the present era, particularly globalization and the revolution in information and communication technology, technical and vocational education should be a vital aspect of the educational process in all countries" [8]. Table 3 shows an increase in enrolment into different vocational centres in the country.

The general increase in enrolment into the VET Centres is a good sign of improvement. It is worth noting however, that vocational training only prepares artisans, it does not address the technical skills shortage affecting the key mathematics- and physical science-related professions. Moreover, there are mismatches in demand and supply of skills to address the ever-growing skills shortages, and this has resulted in industry having less confidence in the public Vocational Education and Training (VET) system. Furthermore, VET qualifications have had little credibility and there has been almost no articulation of credits, which meant that trainees had to retrain and/or repeat subjects to get qualifications from other institutions.

Table 3: Enrolment into Vocational Training Centres

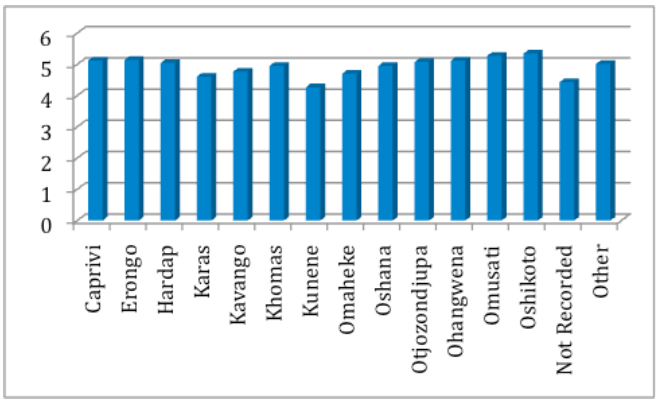
Institution	2007	2008	2009	2010
Windhoek Vocational Training Centre (WVTC)	510	679	796	795
RunduVocational Training Centre	254	238	308	525
ValombolaVocational Training Centre	418	454	318	536
Zambezi Vocational Training Centre	63	138	N.A	110
OkararaVocational Training Centre	330	326	376	294
DAPP Vocational Training School	81	108	150	108
Katutura Youth Enterprise Centre	626	489	1203	N.A
Community Skills Development Centres	1126	1708	1993	1735
Namibia Maritime Fisheries Institute	N.A	67	59	93
Namwater	N.A	N.A	195	202
Nampower	15	24	25	27
Namibia Institute of Mining and Technology	918	1124	1583	2409
St. Charles Lwanga Major Seminary	27	44	36	37
National Health Training Centre	N.A	8	48	31
NICE/Wolwedans	N.A	15	32	186
Phillipi Trust Namibia	N.A	348	459	241
Shadonai Beauty School	N.A	88	125	176
National Occupational Safety Association Namibia	N.A	206	236	392
International Training College Lingua	302	405	461	621
ILSA Independent College	N.A	243	275	470
Helmut Bleks Foundation	N.A	N.A	N.A	30
TOTAL	4670	6706	8678	9018

4. The Knowledge Economy

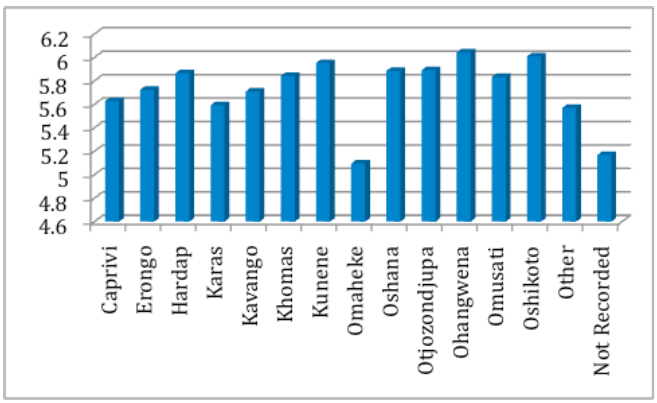
The knowledge economy of any country is directly related to the education, Information and Communication Technology (ICT) infrastructure, economic incentives and innovation (Table 4). The knowledge economy index (KEI) indicates the readiness of a country for knowledge economy. The evident lowest scores for education, innovation and hence the knowledge economy index are concerning. These are normally dependent on application of technical skills. The performance in physical science and mathematics; is currently used by many countries as indicator for acquisition of technical skills; which if applied appropriately, lead to innovative solutions. Performance in Physical Science and Mathematics for the period 2008 to 2012 is shown in Figure 2(a) and (b).

Table 4: Relative Knowledge Economy (KE) Readiness [9]

Country	Knowledge Economy Index	Economic Incentives	Innovation	Education	ICT Infrastructure
Sweden	9.25	8.36	9.67	9.20	9.78
Finland	9.12	8.61	9.56	9.17	9.13
U.S	8.69	7.81	9.47	8.43	9.03
Australia	8.66	8.14	8.68	9.14	8.67
Japan	8.26	7.23	9.30	8.09	8.40
Singapore	8.22	9.53	8.60	5.61	9.13
South Korea	7.70	6.10	7.88	7.80	9.03
South Africa	5.36	5.22	6.19	4.56	5.46
Malaysia	5.32	5.52	4.43	4.51	6.81
Botswana	4.96	6.49	5.17	3.75	4.43
Mauritius	4.32	4.41	2.64	3.81	6.44
Namibia	3.42	5.19	1.83	2.65	3.97



(a)



(b)

Figure 2: Average Grade 12 performance for the period 2008 to 2012 for: (a) Mathematics, (b) Physical Science

Using a generalised point scale of A - 7 (80% and above), B - 6 (70 to 79%), C - 5 (60 to 69%), D - 4 (50 to 59%), E - 3, (40 to 49%), F - 2 (30 to 39%) and G - 1 (below 30%); the overall performance by most regions seems satisfactory. The scores for Mathematics are higher than the Physical Science scores, which is not common for most African states.

The scores are generally what is expected based on the projections made for the 2005 to 2011 period (Table 1). The question remains why the country struggles with innovation and knowledge economy when the Physical Science and Mathematics performance is satisfactory. Does the system facilitate transference of the right skills at the right level/stage for the learners to be sufficiently prepared for making a meaningful contribution to the knowledge economy? Is the foundation firm enough for the Institutions of higher learning to build on?

5. Concluding Remarks

The following actions common to education and training for knowledge economies are suggested for improvement of the Namibian Education System and ultimate increase in technical skills: (1) Implementation of policies that emphasise wide and equitable access to high quality education in order to quickly build a high threshold of educated and skilled human capital; (2) Curricula that emphasise the attainment of solid foundation skills like numeracy, literacy, language; and the attainment of competencies required for effective functioning in a KE, namely mathematics, science, problem solving, critical thinking, working together in teams, analyzing and evaluating situations; and (3) treatment of subject matters as resources through which learners' competencies are developed, not as content to be mastered as an end in itself.

Implementation of a concept and skills checklist [10] showing the depth of knowledge and skills acquired at any level of education is also crucial for transference of technical skills.

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