ICTs in our schools

What do we know, where do we stand globally, what are the trends?

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1 April 2014

In a nutshell, we have somewhat better data on ICTs in schools than we did a few years back, yet it is still difficult to obtain a good picture of the situation in schools. In 2011, 49% of learners at the lower secondary level in South Africa's schools had access to educational computers at the school. The average number of computers per school, counting only schools that have them, was 40 (this was at the secondary level). According to TIMSS, the situation improved considerably between 2002 to 2011, as one may expect given factors such as declines in the prices of computers. Specifically, the 49% learner access figure seen in 2011, was 28% in 2002. Whilst the 49% figure may seem good, South Africa in fact performs poorly here compared to other developing countries such as Ghana (78%), Botswana (86%) and even Honduras (61%).

The General Household Survey points to very low levels of internet access in schools for learners, and to virtually no improvement trend in recent years. Only around 5% of learners access the internet at school.

The offering of the subjects 'computer applications technology' and 'information technology' in grades 10 to 12 can be considered a sign of adoption of ICTs in schools. In recent years, these subjects have remained limited to around 24% of schools, though there have been noteworthy increases between 2008 and 2012 in Eastern Cape (15% to 19%) and especially Free State (42% to 56%), which could point to good ICT leadership in those provinces. In Limpopo, only 6% of schools with Grade 12 offer either of the two computer subjects, a figure that is much lower than what is seen in any other province. In this respect, Limpopo can be considered an 'ICT desert'.

This short report provides a few factual updates on information and communication technologies (ICTs) in schools. New information is obtained in particular from the 2009 to 2012 trends we are able to see in the General Household Survey (GHS) and the 2002 and 2011 TIMSS trends. Moreover, a few patterns with respect to computer-related subjects in the Grade 12 examinations are presented.

How good are our statistics?

Basic statistics on the availability and use of technologies such as computers and the internet amongst teachers and learners are not easy to come by, and where they exist, they are usually not comparable over time as data gathering processes are not standardised. It seems the best data we have with comparability across several years are the GHS data, and the TIMSS data.

What are the key values?

The 2011 *Action Plan*, in its section on e-education, provides the key national statistics that were available at the time, many drawn from the background questionnaires of sample-based testing systems such the Systemic Evaluation, PIRLS and SACMEQ. A few key values published in the 2011 plan are the following:

- *Percentage of teachers who use or have access to computers.* The 2011 plan states that 60% of teachers had access to some kind of computer at school by 2007[1].

- *Percentage of learners using computers in schools.* The 2011 plan, drawing from SACMEQ 2007, said that 37% of learners at the primary level had used a computer at school.

- *Percentage of teachers with access to the internet.* The 2011 plan says that around 20% of teachers had access to the internet in their school.

- *Percentage of learners with access to the internet.* The 2011 plan, drawing from Stats SA data, says that by 2009 20% of learners had access to the internet *at home.* Access at school figures are not provided, but as discussed below the GHS points to around 5% of learners enjoying internet access at school by 2012.

What has changed in recent years?

The 2011 *Action Plan* argued that the available statistics pointed to a clear improvement in the availability of ICTs in schools, but no truly comparable statistics from different points in time were presented. Currently, the data situation is a little better as two sources of data, TIMSS and the GHS, do allow for comparison with respect to certain variables[2].

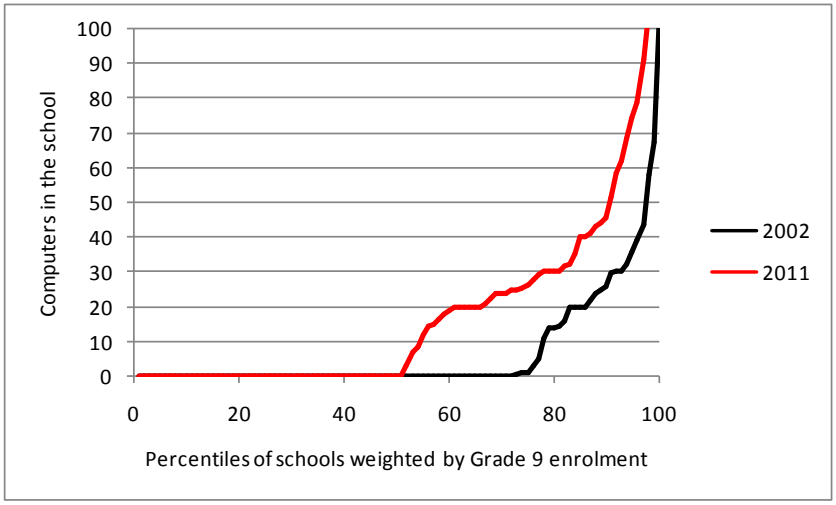
TIMSS responses in relation to the Grade 9 collections for 2002 and 2011 were compared. The TIMSS background questionnaire data do suffer from a noteworthy missing values problem, but careful evaluation of the data allowed for a sufficiently accurate picture of the trend with respect to computers in schools to be extracted. The picture is presented in the next graph. The principal was asked what the total number of computers was in the school that were be used for educational purposes by students. The responses produce mean values of schools with computers of 28% for 2002, against 49% for 2011. These statistics are learner-weighted, so for instance in 2011 49% of Grade 9 learners would have been in schools with computers which were used for educational purposes[3]. The situation has clearly improved between 2002 and 2011. The percentage of schools with zero computers, for educational purposes, declined from 72% to 51% (again, learner weights used). This can be seen in Figure 1 if one looks at where the curve for each year 'takes off' from the horizontal axis. Amongst schools which had computers, the average number of computers per school increased from 26 to 40. The TIMSS data then do point to a substantial improvement, in fact more or less a doubling of access by learners to computers. However, one should keep in mind that these statistics are applicable at the secondary level.

[1] The *Action Plan* says the source is PIRLS 2006. I checked and this should actually read SACMEQ 2007.

[2] A gap in the current report is any reference to the Annual Survey of Schools (ASS). Between 2009 and 2012, this survey asked the principal how many computers for administrative use and how many computers for educational use were available in the school, as well as whether the school had internet access. These data were examined, but there are clearly problems with the data, some of which may be resolvable. Specifically, some question numbers have been switched round in the data but it is not always clear what the right question numbers should be. EMIS is looking into this, and this is probably resolvable. Perhaps more seriously, there are many schools missing in the 2009 to 2012 datasets. Entire provinces are virtually absent for some years. There was a separate ICT module in the ASS in 2011, but here the problem is also that many schools did not respond.

[3] If one applies no weights, 49% becomes 51% and 28% becomes 27%, so the weights in this context make very little difference (though in other situations weighting schools by learners can make a large difference to the statistics).

Figure 1: Computers available for learners 2002 and 2011 in TIMSS



The GHS, in 2009, introduced a number of questions on internet access at the household level. The GHS question is: 'Do members of this household use any of the following internet services?' Then a number of options are provided, which grew as additional options relating to cellphones and 3G access were introduced in 2011 and 2012. The 2012 addition is a bit problematic as it overlaps with the 2011 addition (see below), but overall this is not too serious a problem. The statistics in the next table are percentages of households. Stats SA's official GHS reports include a few of these statistics, but not all the breakdowns provided here, in particular not the education institution category. What is clear is that access to the internet through any education institution remains low, at around 5%. Of course these figures include non-schools, such as universities, so one might expect the school statistic to be lower than 5%.

Table 1: Household access to the internet

	2009	2010	2011	2012
Internet connection in the household	9	11	10	10
Internet in a library or community hall/Thusong centre	2	3	3	2
Internet for students at a school/university/college	4	6	5	5
At place of work	14	17	16	18
Internet Café	5	7	6	6
Internet access using cell/mobile phone or 3G card as modem				7
Internet access on cellphone (2011)/ Internet access on cell/mobile phone (2012)			19	29
Do not know	2	0	1	1
Other	1	1	0	0
Any (excluding cellphone)	23	28	27	28
Any (with cellphone)			35	40

Note: The internet café category is the result of a collapsing of two categories in the GHS: an internet café more than 2km from the home and one more than 2km from the home. The spread across those two distance categories is roughly equal.

In an attempt to get statistics for just school learners, the GHS data were filtered so that only households with school learners, and without household members enrolled in other kinds of education institutions, were included. The national statistics were then weighted by learners. The result is the following table. One problem with this method is that some households with learners would have been excluded, specifically those with people in both schools and other types of education institutions. The exclusion came to around 8% of all school learners. Despite this problem, the statistics we see below are probably very close to what one would get if one had a separate variable for just schools. In fact, the statistics below differ only slightly from those in the previous table.

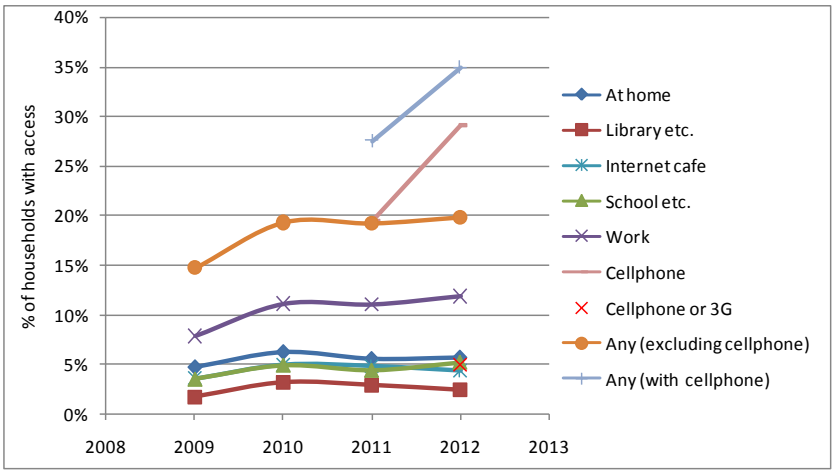
Table 2: Learner access to the internet

	2009	2010	2011	2012
Internet connection in the household	5	6	6	6
Internet in a library or community hall/Thusong centre	2	3	3	2
Internet for students at a school/university/college	4	5	4	5
At place of work	8	11	11	12
Internet Café	4	5	5	4
Internet access using cell/mobile phone or 3G card as modem				5
Internet access on cellphone (2011)/ Internet access on cell/mobile phone (2012)			17	27
Do not know	2	0	0	1
Other	1	1	0	0
Any (excluding cellphone)	15	19	19	20
Any (with cellphone)			28	35

What should be of concern is that access to the internet within schools should be so low and that there is no marked upward trend. The statistics seen above for schools are moreover slight under-estimates in the sense that if one child in a household had access through the school, but the other did not, the response would still be 'Yes'. In a similar vein, the 'any' statistics should be interpreted with caution. They are not saying that, for instance, in 2012 35% of learners had access of some sort (including via cellphone) to the internet. The statistic means that 35% of learners were in households where at least one person had internet access. We cannot tell from the data whether individual learners had internet access because the data are gathered through a household-level question.

The following graph illustrates the statistics from the previous table.

Figure 2: Internet access trends for households with learners (GHS)



One telling statistic is the number of schools offering the Grades 10 to 12 subjects 'computer applications technology' and 'information technology'. One might expect this statistic to be correlated with general growth in ICT in schools. As more schools obtain computer centres, for instance, more schools would be able and interested in offering the two subjects in the curriculum with the strongest explicit ICT orientation. One can presume that formal adoption of the two subjects in question would greatly enhance ICT human capacity amongst teachers and learners, which would make it easier for the school to negotiate and maintain good internet connections and run school administration software. At the national level, no strong trend is clearly discernable. Specifically, between 2008 (when the new subjects started in Grade 12 in their current form) and 2012, the number of candidates in the two subjects remained static: 9% of full-time examination candidates in public ordinary schools took either

(or both[4]) of the subjects in the 2008 and 2012 examinations. The percentage of public ordinary schools participating in the examinations and offering either of the two subjects moved very slightly, from 23% to 24% between the two years. However, at the provincial level, there were two significant trends. Both EC and FS increased the number of schools with students taking either subject substantially, as seen in the following table. These provinces increased the number of schools with either of the two subjects by 25% and 34% respectively, and thus saw far greater increases than any other provinces. Understanding the dynamics behind these improvements is important for the system as a whole[5]. What is worrying is that LP experiences a presence of the two subjects which is far below anything seen in any other province. The percentage of schools offering either subject was just 6% in 2012, against a figure of 29% for the other eight provinces combined. These figures suggest LP is a bit of an 'ICT desert' in the national context.

Table 3: Computer-oriented subjects in Grade 12 (2008 to 2012 trend)

	2008						2012						
	All schools	Both subj.	Only CAT	Only IT	Total CAT or IT	%	All schools	Both subj.	Only CAT	Only IT	Total CAT or IT	%	%
	A	B	C	D	E	E of A	F	G	H	I	J	J of A	J of E
EC	849	14	109	6	129	15	868	15	141	5	161	19	25
FS	297	21	102	3	126	42	302	16	151	2	169	56	34
GP	515	100	104	15	219	43	546	79	138	5	222	41	1
KN	1,561	62	243	45	350	22	1,620	36	278	45	359	22	3
LP	1,324	16	67	4	87	7	1,354	14	64	2	80	6	-8
MP	488	27	62	5	94	19	495	17	77	1	95	19	1
NC	123	6	45	0	51	41	127	6	49	0	55	43	8
NW	341	26	45	4	75	22	359	20	57	0	77	21	3
WC	342	50	159	7	216	63	355	41	185	5	231	65	7
SA	5,840	322	936	89	1,347	23	6,026	244	1,140	65	1,449	24	8

How do we compare globally?

There are unfortunately no comprehensive international tables with more or less comparable statistics on things like computers and the internet in schools. The World Bank, for one, is working on filling this gap. There are statistics, published for instance by the World Bank, on country trends with respect to internet access in society as a whole. Those statistics, however, need to be interpreted with a lot of caution as it is clear that differing definitions are used across countries and years, in particular whether access via a smartphone is included or not seems inconsistent.

TIMSS allows for some comparison across developing countries at the lower secondary level. Statistics are provided in the following graph and table. It should be noted that the official TIMSS report provides statistics which are slightly better than those provided below, because it appears as if the TIMSS analysts interpreted missing values incorrectly. For instance, the percentage of Grade 8 learners in Ghana with access to computers in the school is 78% below, but 85% in the official 2011 TIMSS report. The statistics illustrate that South Africa does not fare well in an international comparison, at least not according to these statistics. The percentage of lower secondary learners with access to computers at school is lowest in South

[4] In 2008, 340 students took both subjects, in 2012 there was no such overlap, presumably because rules barred taking both of these two rather similar subjects.

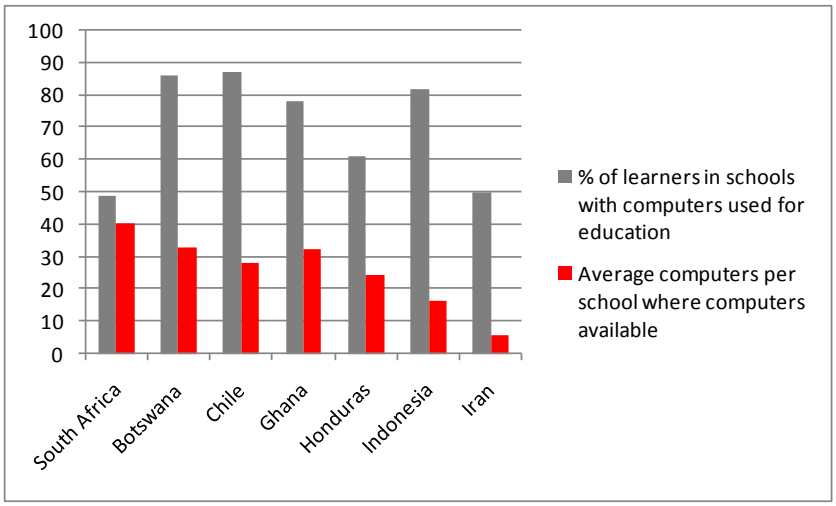
[5] As a check, the analysis was run using only schools present in both the 2008 and 2012 datasets. This check confirmed the figures seen in the table here. One is dealing, in the case of EC and FS, with schools which did not offer the two subjects in 2008, but did offer them in 2012. The effect of new schools existing in 2012, with the subjects in question, but not existing in 2008, is a negligible factor in the provincial trends.

Africa across all seven countries drawn from the TIMSS dataset, essentially South Africa plus other developing countries which we can consider comparator countries. Iran is in a similarly weak position. Access in Botswana is much greater than in South Africa. The fact that the low income country Honduras should fare better than South Africa is not a good sign. South Africa does fare well against the indicator of average number of computers per school, but this could simply be a reflection of the general inequality in school access to computers within South Africa. Access is concentrated amongst the better off and urban in society, and they are able to secure large school computer centres. Moreover, urban schools tend to be larger, so one would expect more computers per school. Gross enrolment ratio (GER) statistics (from UNESCO *Education for All* reports) are included because learners outside schools would obviously have no access to school computers and a high GER might explain South Africa's poor performance in the first column of the data. However, the figures suggest we are not dealing with a large enrolment effect. Even after ones takes into account GER, South Africa's schools-with-computers values are particularly low.

Table 4: Country statistics for computers in schools 2011

	% of learners in schools with computers used for education	Average computers per school where computers available	GER for lower secondary
South Africa	49	40	96
Botswana	86	33	91
Chile	87	28	100
Ghana	78	32	83
Honduras	61	24	75
Indonesia	82	16	92
Iran	50	6	98

Figure 3: Country statistics for computers in schools 2011



Note: The statistics, calculated from the TIMSS database, reflect computer access levels at the lower secondary level only, specifically grades 8 or 9.

Useful documents

UNESCO: UIS (2009). *Guide to measuring information and communication technologies (ICT) in education*. Montreal. Available from: <http://unesdoc.unesco.org/images/0018/001865/186547e.pdf> [Accessed March 2014].