## Computer access in schools according to TIMSS

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There is not much data on what ICTs schools have and how they use them. Perhaps the most reliable and useful source, though it only has one or two relevant variables, is the TIMSS data. Its usefulness derives partly from the fact that this source allows for an international comparison. The following two graphs provide the TIMSS picture for South Africa and a few comparator countries – all developing countries. At the end of this document, are important explanations. The objective was to find out the extent of access to computers (or tablets) in the school *generally*, not just access for the purposes of studying mathematics or science, the two subjects tested in TIMSS. There are TIMSS questions on the latter, but these were not used.

Figure 1 is rather 'busy', but it is transparent about the fact that TIMSS questions, and who was asked, changed over time (more details on this below). A less 'busy' version of Figure 1 appears as Figure 2. What can we tell from Figure 1? In general, asking school principals instead of students produces considerably higher statistics, for instance 64% from students against 100% from school principals in Egypt in 2007 – 2007 is the only year where both respondents were asked. There are several possible reasons for this. For instance, principals may not know that some students do not access the school's computers. But whether one focusses on the student responses, or the principal responses, there have been some dramatic improvements in some countries, for instance: Indonesia 2003 to 2007 (38% to 80% - students asked); Botswana 2003 to 2007 (28% to 70% - students asked); Ghana 2007 to 2011 (18% to 85% - principals asked); and Iran 2007 to 2015 (30% to 80% - principals asked).



Figure 1: Grade 8 access to computers

Note: In the case of South Africa and Botswana in 2011 and 2015, Grade 9 and not Grade 8 students were the focus of TIMSS. A dotted line in the graph means two points using different methods, based on different respondents, are joined.

What is disappointing is that South Africa has not registered any dramatic improvement. The trend between 2003 and 2011 is an upward one, but here one is not comparing apples to apples as different respondents apply. For 2011 to 2015 there was in fact a decline. Could this be real? Maybe not. There is a confidence interval either side of the 2011 and 2015 points of as much as 8 percentage points – we can be 95% certain that the 2011 value lies between 46% and 62%, for instance. So perhaps the apparent downward trend is a sampling issue. What is noteworthy is that several countries saw a slight decline between 2011 and 2015. This is difficult to explain. Perhaps it was the knock-on effects of the global financial crisis. The only change in the question was that in 2015 the principal could count both computers and tablets, while in 2011 the question referred just to 'computers'. Of course this should not lead to a decline in the values. Returning to South Africa, a decline is not impossible. In fact, the 2018 official report for the Grade 12 examinations indicates that participation in the subject Computer Applications Technology has been in decline in recent years. What is noteworthy is not a possible decline however, but the absence of a 'take-off' in South Africa along the lines of what has been seen in other countries. In 2003, South Africa was about on a par with countries such as Ghana, Morocco, Botswana and Indonesia. By 2015, all those countries had clearly moved to a level well above South Africa's. Iran, a clear laggard in 2003, had surpassed South Africa by 2015.

Figure 2 provides a more simplified, though less informative, view. Where values derived from students and principals existed in 2007, the average of the two was used.





The final graph brings the values from TIMSS Grade 4 into the picture. Clearly, access across the two levels tends to be similar, though it is generally a bit lower at the primary than at the secondary level. South Africa's primary level access stands out as high, at least compared to the secondary level. The data were examined to see whether there was anything strange. Some primary schools do have very few computers for learners to access. However, if one excludes any school with fewer than five computers, one still ends up with a relatively high value of 46% of learners (as opposed to the 51% shown in the graph).



Figure 3: Grade 4 and Grade 8 access in a recent year

The following table provides details regarding question changes and how statistics for Figure 1 were obtained. Obviously, questions changed similarly for all countries. Thus within a year, the comparison is highly reliable, though the usual confidence intervals applicable to sample-based data apply. However, one needs to be careful about the comparison over time, above all by keeping mind who was asked what in the survey questionnaires. This is particularly important in the case of the simplified Figure 2.

Year	The questionnaire	The official international TIMSS report
2003	Question to student: 'Where do you use a computer? A – At home; B – At school; C – At a library; D – At a friend's home; E – At an internet café; F – Elsewhere'. The student needs to answer 'Yes' or 'No' to each of these six options.	Abridged results in Exhibit 4.6. Only the 'home' and 'school' categories reported on. <i>Figures from the report used for the graph</i> .
2007	The same question as for 2003, but in addition the following new question asked of the school principal: 'What is the total number of computers in your school that can be used for educational purposes by eighth grade students?'	Again, Exhibit 4.6 reflects responses from students. Data from the question posed to principals are not used for the report. <i>The</i> graph features two figures per country for 2007. On the one hand, the trend from 2003 reflects the response from the student. On the other, the beginning of a new trend reflects the response from the school principal. The first is taken from the official report, the second from the downloaded microdata.
2011	The 2003 question no longer appears. The 2007 question to the principal continues.	Exhibit 5.15 reflects the principal responses. Categories of numbers of students per computer are reported, with one category being zero computers. <i>The graph features the sum of</i> <i>the non-zero students</i> .
2015	The 2011 question to the principal continues, with one important change. The principal is now allowed to count computers <i>and tablets</i> .	The report does not report at all on general (as opposed to mathematics-specific) computer access. For the graph, the microdata were analysed to produce statistics comparable to the 2011 (and 2007, school principal response) statistics (though of course the 2015 value could include tablets).