Letter from the CEO

Monitoring and Evaluation is a critical pillar of any organisation and Camara Education is no different. The results highlight the level of effectiveness of the Camara model and hence provide crucial input to further improve both the model and its execution. Camara's core value in its approach to M&E has always been transparency, which is only right given the number of stakeholders in Camara who give money, technology or time. Over the three years producing M&E reports, Camara has also improved the M&E process to ensure that more of the right information is being captured that is relevant for our stage.

The information provided in previous M&E reports has resulted in management action taken on a number of areas.

- The 2009 report highlighted a shortfall in the level of support and governance provided to our African hubs on the back of which we have made a significant investment in our Africa Services Centre who provide these services to the hubs.
- The 2009 report also highlighted the minimal impact in Ethiopia. We have since set up a new hub in this country, this time with agreements with the local Ministry of Education and local Bureau of Education.
- Based on previous hub audits, we performed a complete financial audit across the Camara network in 2010 and a follow up remediation project has been underway since the start of 2011.
- One of the previous weaknesses identified has been that there is insufficient operational data collected in the hubs to support the management team. A project has been underway since the start of 2011 to build and roll out a local hub Management Information System.

This year the following data was captured:

- Reports from 83 school visits
- Surveys from 377 trainees
- Audits of Camara Education and 3 Camara Hubs
- A review of the randomised controlled trials on ICT in education

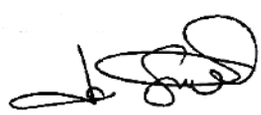
The key results are as follows:

- Camara Education remains cost effective, in large part due to the large value gained by refurbishing computers.
- The cumulative effect of small PC attrition rates at each stage of the Camara supply chain results in a lower proportion of PCs delivered to recipients that we would like.
- The breakage rate of a Camara PC delivered is very favourable and comparable to that of new computer's.

- Our Kenyan hub underperformed significantly compared to the other two hubs audited which has since resulted in the management team been replaced earlier this year.
- In schools that received computers the reported weekly usage would only allow regular access for a minority of students.

Included in this report is some research on the impact of ICT in Education. We are currently researching the impact of ICT literacy and also have plans to do an impact assessment. While we have lots to improve on, we are proud of the progress that Camara continues to make.

Kind regards



John Fitzsimons

CEO

Camara Education

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1. Introduction

This document attempts to build on the 2009 M&E report while ensuring that the data is still comparable year-on-year. The report is aimed at both an internal and external audience as the primary point of reference for anybody attempting to evaluate the organisation. The section on the A10 short-term volunteer programme begins with a cost-benefit analysis. It also profiles the trainees, and endeavours to gain a better insight into their aspirations and perspectives on technology and education. The school visits section aims to profile the recipient schools from 2009 and to track the computers dispatched from Dublin and Belfast. It also makes a first step at examining the frequency and types of usage in the classroom.

Significant effort was made to ensure the objectivity and transparency of the Hub Audits more objective and transparent than in 2009. The scores given are justified in the accompanying reports. Where expectations of Hubs were not clearly stipulated in their 2010 agreements with Camara Education the criteria have been discounted for this year, most notably in terms of maintenance and recycling. The audits reflect the performance of the Hubs relative to expectations at a given point in the Camara network's evolution. Clearly, expectations will grow as the Camara network becomes more sophisticated and the scores should be taken as indicators of relative performance.

The final section is a short review of the existing evidence on ICT in education. It focuses almost exclusively on randomised controlled trials (RCTs), which are considered the highest form of evidence. Collectively the studies form a valuable resource, and should be considered the most robust and informative impact assessments in the field. Any organisation working in ICT in education should frame its activities in this context.

Cost-Benefit Analysis

Conducting a cost-benefit analysis across the network as a whole is still difficult. The accounts kept by the African Hubs were incomplete in 2010, and many of the outputs involved remain difficult to monetise. Even withstanding the support given to the Hubs, it is unlikely that any of them are producing economic value for beneficiaries above and beyond their costs. The primary causes are large computer stockpiles at the end of the year, low costs of the basic training alternatives in the market place and the fact that the maintenance operations of the Hubs are still largely unsystematic and undocumented. A year-long maintenance contract for a school in Kampala is worth approximately €800 based on local prices[1]. As the Hubs professionalise their maintenance systems there is the potential to demonstrate a real economic return.

Camara Education's direct programme costs and benefits are demonstrated below. As in the 2009 report, volunteer hours are not included. Costs allocated to fundraising and supporting the receiving Hubs have been subtracted from the total since they would not be incurred by a comparable for-profit enterprise. Only the benefits that accrued to intended beneficiaries are included, so the very significant stock increase in Camara Education has not been counted.

Camara Education		
	Benefit	**Costs**
Direct Programme Costs		€705,754
Computers dispatched	€785,700.00	
Trainees (A'10)	€32,481.00	
Total	€818,181	€705,754
Cost/Benefit		€112,427
Cost/Benefit (%)		15.9%

1 http://www.secondlife.co.ug/services.html

2. Africa 2010 Volunteer Training Programme

	Uganda	%	Rwanda	%	Kenya	%	Zambia	%	Aggregated	%	2009
Estimated Number of Trainees	300		230		143		300		**973**		
Estimated Number of Courses Delivered	330	110%	239	104%	244	171%	390	130%	**1203**	**124%**	
Total number of Surveys Administered	**119**	40%	**35**	15%	**121**	50%	**102**	34%	**377**	**35%**	259
Occupation											
Teachers	69	58%	27	77%	22	18%	68	67%	**186**	**49%**	69%
Other school staff	11	9%	1	3%	0	0%	7	7%	**19**	**5%**	11%
Teachers and school staff	80	67%	28	80%	22	18%	75	74%	**205**	**54%**	80%
Number of Schools	25		6		15		39		**85**		
Gender											
Females surveyed	36	30%	2	6%	51	42%	50	49%	**139**	**37%**	45%
Males surveyed	83	70%	32	94%	70	58%	52	51%	**237**	**63%**	56%
Female Teachers	23	33%	1	4%	9	41%	32	47%	**65**	**35%**	35%
Male Teachers	46	67%	26	96%	13	59%	36	53%	**121**	**65%**	65%
Age											
Mean teacher age	30		31		31		37		**33**		30
Maximum age	60		41		68		56		**68**		
Minimum age	16		20		20		21		**16**		

	Uganda	%	Rwanda	%	Kenya	%	Zambia	%	Aggregated	%	2009
Attendance and Costs											
Mean days attended	4.5		1.5		4.5		4.6		**4.1**		
Mean charge at time of training (rather than included as part of a package with the pcs)	UGX 0		RWF 0		KES 1,420		ZMK 241,525				
Mean costs incurred by trainees	UGX 38,945		RWF 921		KES 1,061		ZMK 441,885				
Charge (€)	€0.00	0%	€0.00	0%	€12.81	58%	€36.17	35%	**€14.74**	**33%**	
Costs (€)	€12.87	100%	€1.15	100%	€9.46	42%	€66.17	65%	**€30.25**	**67%**	
Combined costs and charges (€)	€12.87		€1.15		€22.27		€102.33		**€44.99**		
Teachers with costs subsidised by school	13	19%	5	19%	3	14%	62	91%	**83**	**45%**	
Teachers who were from Camara schools	66	96%	25	93%	19	90%	62	91%	**172**	**93%**	49%
Teachers who were from non-Camara schools	2	3%	2	7%	2	10%	6	9%	**12**	**7%**	51%
Teachers who took unpaid leave	29	42%	20	91%	12	55%	28	41%	**89**	**51%**	
Teachers who were paid during training	35	51%	2	9%	10	45%	40	59%	**87**	**49%**	
Number of modules attended											
Teachers who attended 1 module	7	10%	24	96%	1	5%	27	27%	**59**	**27%**	59%
Teachers who attended 2 modules	42	61%	1	4%	12	55%	43	43%	**98**	**46%**	30%
Teachers who attended 3 modules	14	20%	0	0%	6	27%	8	8%	**28**	**13%**	5%
Teachers who attended 4 modules	1	1%	0	0%	1	5%	10	10%	**12**	**6%**	4%
Teachers who attended 5 modules	5	7%	0	0%	2	9%	7	7%	**14**	**7%**	0%
Teachers who attended 6 modules	0	0%	0	0%	0	0%	2	2%	**2**	**1%**	0%
Teachers who attended 7 modules	0	0%	0	0%	0	0%	2	2%	**2**	**1%**	0%
Total number of modules attended by teachers	162		26		57		238		**483**		

	Uganda	%	Rwanda	%	Kenya	%	Zambia	%	Aggregated	%	2009
Distance travelled											
Teachers who travelled 0-10km	46	67%	21	84%	12	55%	23	23%	**102**	**47%**	68%
Teachers who travelled 10-20km	18	26%	2	8%	2	9%	19	19%	**41**	**19%**	
Teachers who travelled 20-40km	5	7%	1	4%	3	14%	7	7%	**16**	**7%**	
Teachers who travelled 40-100km	0	0%	0	0%	1	5%	46	46%	**47**	**22%**	9%
Teachers who travelled 100-200km	0	0%	0	0%	3	14%	2	2%	**5**	**2%**	3%
Teachers who travelled over 200km	0	0%	1	4%	1	5%	4	4%	**6**	**3%**	2%

*While the means for 2010 were compiled slightly differently to 2009, they are still directly comparable.

Based on the number of modules that the A10 team reported delivering, the value produced represents approximately €32,500 based on market values.[2] Given that only 54% of the trainees were teachers or school staff, and not all of these from Camara schools, the value delivered to Camara's customers must be reduced to approximately €16,300. While quality training is essential for schools if they are to use technology in any meaningful sense, a cost-benefit analysis does highlight the need to move towards local trainers.

Developing the teacher-training capacities of the Hubs will require a significant degree of mentoring and support by internationally-certified experts. There is certainly a justification for the short-term volunteer programme insofar as the skills are not available locally and it is focused on supporting teacher-trainers who are based in the Hubs. To date the programme has focused on directly training teachers, which has probably been a natural step in Camara's development. In future years, a core training function centred on local teacher-trainers who are supported and mentored by volunteer specialists are certainly a direction the organisation should consider.

Within these parameters, the findings from Africa 2010 are reasonably positive.[3] Rwanda, Zambia, and Uganda showed strong impetus to use the programme to train teachers, whereas Kenya clearly failed to deliver against the project objectives in this regard. The gender balance overall is slightly less balanced than it was in 2009, though the proportion of female teachers to male teachers remained consistent. There is a clear need to specifically target female teachers for future Camara training, particularly in Rwanda where the bias was enormous.

Evidently those teachers driven to attend the training are on the whole relatively young, though still presumably well-established within their schools. The mean day attended are encouraging, except for Rwanda where they were significantly lower. The charges and costs incurred are very illuminating, since they illustrate just how expensive the cost of living is in Zambia relative to the other countries. At this juncture, however, it is important to reflect on the fact that the vast majority of trainees in Rwanda were local. Otherwise the costs incurred would likely have been very much higher. It is positive to see that the cost of computers in Rwanda and Uganda includes free teacher training, and that Zambia incentivised maximum attendance by charging per school rather than per trainee.

2 Charges based on http://www.secondlife.co.ug/training.html for comparable courses but shorter hours.
3 Aggregate means for 2009 weighted all countries equally. For 2010 they were weighted based on the number of teacher respondents. Attendance, costs and charges are all attributed to teachers only for 2010. For 2009 attendance, distance and age means were from all trainees.

2.1 A10 Qualitative Feedback

2.1.1 Kenya

The consensus among teachers, as explicitly articulated by one of the trainees, seems to be that Kenya is very far behind in terms of ICT, and needs help to catch up. One teacher emphasised the potential for ICT in the region, underpinned by a world-class broadband infrastructure. Another focused on the need for additional support in ICT for marginalised areas of the country.

The most prevailing comment with regard to the A10 training itself was a request for more time, particularly to practice the class content during the course. There was some demand for more focus on the practicals of ICT rather than the theoretical. Group-work was also recommended as a positive learning forum, and the circulation of handouts was cited as being a possible improvement. One teacher suggested that certification from a university would enhance the value of the training. Moodle was cited repeatedly as being important and useful, as was computer maintenance. One respondent suggested that Camara needs to bring the training to teachers as much as possible, given that many cannot get time off work to attend. Another emphasised the need to hold classes at times that suit the students, and not to keep changing them.

The development of critical thought was cited as a benefit of technology, as was its use in everyday life. There seems to be a widespread consensus that teaching technology to students helps them secure jobs when they graduate. One teacher stressed that “computer people are marketable these days, especially here in Kenya”. From a more reactive perspective, teachers see immense changes happening through technology, and feel that they and their students have to change simultaneously or be left behind. Teachers surveyed had a nearly universally positive view of technology and its impact on their lives.

2.1.2 Zambia

An interesting request from teachers in Zambia was to be able to borrow laptops during training so they could do extra practice in the evenings. Respondents cited numerous pedagogical benefits of computers, from communication and access to information, to preparing lessons, research, and access to educational software. By providing better access to information and lesson plans, ICT was seen as having the potential to make teaching more effective. A large number of teachers cited mobile phones as being their primary previous experience with ICT. Teachers requested much more training, with longer and more frequent courses.

2.1.3 Rwanda

Again, the need for more time was expressed repeatedly by teachers in Rwanda, particularly time to practice what they had learned. Marble, KTux, and Wikipedia were cited as being the most useful programmes, which probably suggests a predisposition towards comprehensive materials and simple functionality. One teacher stressed the potential for technology to help his school become an education leader. Another explained that technology helps both as a source for teaching material and as a teaching tool, which is a particularly astute and useful distinction.

2.1.4 Uganda

Teachers reported that they attended the training to learn basic computer skills, maintenance, and more about Linux. In terms of advertising the training the Hub appears to have excelled, having sent written invitations, visited schools, and even made radio announcements. Teachers cited networking, maintenance, ICT in education, and Moodle as being the most useful aspects of the training. They did express some trepidation about being able to use Moodle however, with several concerned that it looked difficult to set up and that their schools are inadequately equipped for it in terms of hardware.

With regard to improving the training, the single most common suggestion was to increase the time given. Power failure was deemed one difficulty which hampered the courses, and teachers also suggested that training should be delivered during the school holidays. They requested handouts; one computer per trainee; for workshops to be held

on an ongoing basis by permanent trainers; more in-depth training; and more focus on the practicals rather than the theory of ICT. Several trainees also suggested that attendance should be incentivised, by providing food, transport, accommodation, and even presents. The vast majority of trainees had used technology before, primarily in work or college. Virtually all considered technology to be a positive influence on their lives; facilitating increased knowledge, making work easier and providing some of them with employment directly.

3. M&E School Visits 2010

The objective for 2010 was to conduct monitoring visits on a sufficient number of schools that received computers in 2009 to form reasonably robust conclusions on the profile of the schools and their customer experiences. The school visits also provide an additional layer of accountability, since the Hubs involved are required to verify that their computers have gone to schools. In the coming months the reports will be randomly cross-checked by staff members from Camara Education. The Camara Hubs and the partner in Tanzania provided the data in the table below for 2009. The only information that Camara Education can verify from the outset is that in the 'Received' column.

Table 1: 2009 PCs

Country	Stock 1/1/09	Received	Stock & Received	Delivered To Schools	Decommissioned	Stock 1/1/10	Accounted For	Discrepancy
Ethiopia	120	952	1072	375	125	0	500	572
Kenya	0	1334	1334	752	221	326	1299	35
Lesotho	700	230	930	329	343	140	812	118
Rwanda	0	962	962	226	0	736	962	0
Tanzania	0	974	974	974	0	0	974	0
Uganda	224	994	1218	531	95	592	1218	0
Zambia	0	964	964	486	15	460	961	3
Total	**1,044**	**6,410**	**7,454**	**3,673**	**799**	**2,254**	**6,726**	**728**
Stock & Received				**49%**	**11%**	**30%**	**90%**	**10%**

Only the countries which had a well-established Hub were considered suitable for conducting the school visits in 2010. Unfortunately, this criterion was only met in Kenya, Uganda and Zambia; representing a total of 3,292 computers received, or 51% of the total. Clearly, Camara should aim to visit every computer it dispatches the following year, which should be possible for the 2010 PCs. Nonetheless even the unverified information provided by the Hubs is instructive.

Clearly in 2009 the Rwanda, Uganda and Zambia Hubs received far more computers than they could reasonably deliver within the year. This resulted in significant stockpiles going into 2010, which in turn reduced the necessity of those Hubs to receive computers in that year. In Uganda and Rwanda, this was largely intentional given the prospect of government bans on the importation of refurbished computers, which have since been imposed. However, it does suggest that the capacities of the Hubs are more accurately reflected in the numbers of computers they delivered to schools than in the numbers they received from Camara Education.

The large discrepancy in the numbers of computers received and accounted for in Ethiopia was the primary justification for ending the partnership there in early 2010. In Lesotho large numbers of computers had been stockpiled, and the Hub accordingly received comparatively few in 2009. In Tanzania there is still no Camara Hub, and the computers there were distributed to schools via a religious order. The Rwanda Hub was still in its establishment phase in 2009, and only delivered computers to nine schools.

The methodology for the school visits was that each of the three main Hubs picked a local volunteer or team of volunteers to conduct the visits and submit reports. Each Hub was given a grant from Camara Education and a target to visit and report on all of their recipients from 2009. The M&E Officers were required to report on approximately thirty fields for each school, via the Camara Education website. The major shortfall of the system was that the Hubs did not have automatic access to their own data, but required it to be sent manually. This should be addressed by an organisation-wide data management system in 2011. The aggregate values for 2009 are also given, which included Ethiopia and Lesotho but not Zambia. They also covered schools from multiple years, with schools from 2006-2009.

Table 2: School Visit Data

	Kenya	Uganda	Zambia	Aggregated	2009
Stock 1/1/09	0	224	0	**224**	
Received	1334	994	964	**3292**	
Stock 1/1/10	326	592	460	**1378**	
Decommissioned	221	95	15	**331**	
Reported Delivered to Schools	752	531	486	**1769**	
Discrepancy	35	0	3	**38**	
M&E School Visit Target	41	35	25	**101**	260
Schools visited	31	32	20	**83**	137
Schools visited (%)	76%	91%	80%	**82%**	53%
PCs visited Target	752	531	486	**1769**	
PCs visited	480	498	335	**1313**	2,468
PCs visited (%)	64%	94%	69%	**74%**	
2009 PCs demonstrated to be in schools (%) excluding stock increases	36%	50%	35%	**40%**	
Total number of Students	14,822	14,953	22,834	**52,609**	54,663
Mean per school	478	467	1,142	**634**	479
Median	200	334	700	**342**	429
Min	9	3	10	**3**	
Max	5,291	1,210	3,334	**5,291**	
Mean number of students per computer	31	30	68	**40**	25
Total Boys	6,830	7,492	11,066	**25,388**	
Boys (%)	46%	50%	48%	**48%**	
Total Girls	7,992	7,461	11,768	**27,221**	
Girls (%)	54%	50%	52%	**52%**	
Primary Schools	5	11	8	**24**	
Primary Schools (%)	16%	34%	40%	**29%**	
Secondary Schools	5	13	7	**25**	
Secondary Schools (%)	16%	41%	35%	**30%**	
Community Education	4	4	1	**9**	
Community Education (%)	13%	13%	5%	**11%**	
Religious Institutions	6	2	1	**9**	
Religious Institutions (%)	19%	6%	5%	**11%**	
Other Educational Institutions	11	2	3	**16**	
Other Educational Institutions (%)	35%	6%	15%	**19%**	

	Kenya	Uganda	Zambia	Aggregated	2009
Rural	16	14	4	**34**	
Rural (%)	52%	44%	20%	**41%**	
Urban	15	18	16	**49**	
Urban (%)	48%	56%	80%	**59%**	
Private	20	19	4	**43**	
Private (%)	65%	59%	20%	**52%**	
Public	11	13	16	**40**	
Public (%)	35%	41%	80%	**48%**	
Schools that charge for pc use	15	12	3	**30**	
Schools that charge (%)	48%	38%	15%	**36%**	72%
Schools that do not charge	16	20	17	**53**	
Schools that do not charge (%)	52%	63%	85%	**64%**	28%
Estimated mean charge per annum	KES 4,100	UGX 33,250	ZMK 106,666		
Mean charge per annum in euro	€37	€10	€16	**€24**	
Mean student usage per week	3.19	3.06	1.65	**2.77**	
Max times accessed per week	6	7	5	**7**	
Min times accessed per week	0	0	0	**0**	
Mean class length in minutes	69	70	70	**70**	
Median class length in minutes	55	60	40	**60**	
Mode class length in minutes	120	60	40	**60**	
Mean lab usage per week (hrs)	8.68	7.7	14.6	**9.7**	
Min lab usage per week	0	0	0	**0**	
Max lab usage per week	36	35	48	**48**	
Mean lab usage in rural schools	6.7	6.4	5.3	**6.4**	
Mean lab usage in urban schools	10.8	8.8	16.9	**12.0**	
Total PCs received by schools visited	480	498	335	**1313**	2,468
Mean number received	15.5	15.6	16.75	**15.8**	21.1
Max PCs received	70	36	25	**70**	
Min PCs received	2	2	10	**2**	
Total PCs Broken	53	55	60	**168**	
Total PCs Broken (%)	11%	11%	18%	**13%**	11%
Total PCs Missing	112	10	1	**123**	
Total PCs Missing (%)	23%	2%	0%	**9%**	3%
PCs still working	301	409	275	**985**	
PCs still working (%)	63%	82%	82%	**75%**	87%

	Kenya	Uganda	Zambia	Aggregated	2009
Mean PCs still working per school	9.7	12.8	13.8	**11.9**	
PCs running Windows OS	143	63	25	**231**	
PCs running Windows (%)	46%	12%	9%	**21%**	
PCs running Linux OS	169	449	268	**886**	
PCs running Linux (%)	54%	88%	91%	**79%**	
Labs with surge protection	16	9	16	**41**	
Surge protection (%)	52%	28%	80%	**49%**	
Labs with adequate ventilation and light	27	25	18	**70**	
Ventilation and light (%)	87%	78%	90%	**84%**	
Labs with a steel door	23	25	18	**66**	
Steel door (%)	74%	78%	90%	**80%**	
Labs with grilled windows	26	25	18	**69**	
Grilled windows (%)	84%	78%	90%	**83%**	
Labs with electricity	29	29	20	**78**	
Electricity (%)	97%	91%	100%	**94%**	
Labs with petrol generator	1	2	0	**3**	
Petrol generator (%)	3%	7%	0%	**4%**	
Labs with solar power	0	1	0	**1**	
Solar power (%)	0%	3%	0%	**1%**	
Schools that required maintenance	19	17	17	**53**	
Required maintenance (%)	61%	53%	85%	**64%**	
PCs that required maintenance	56	32	60	**148**	
Schools that had received maintenance	10	7	6	**23**	
Received maintenance (%)	32%	22%	30%	**28%**	
Maintenance recipients who were satisfied	3	6	5	**14**	
Recipients who were satisfied (%)	30%	86%	83%	**61%**	
Reported satisfaction rating of recipients	64%	N/A	57%	**61%**	
Schools who plan return PCs to Hub at end of life	30	5	15	**50**	
Planned to return PCs to Hub (%)	97%	16%	75%	**60%**	
Schools who hadn't thought about it	1	25	4	**30**	
Hadn't thought about it (%)	3%	78%	20%	**36%**	
Schools who plan to bring PCs for recycling	0	2	0	**2**	
Bring for Recycling (%)	0%	6%	0%	**2%**	
Schools who plan to give them to teachers	0	0	1	**1**	
Give them to teachers (%)	0%	0%	5%	**1%**	
Number of schools with students with disabilities	6	16	9	**31**	
Schools with students with disabilities (%)	19%	50%	45%	**37%**	
Number of students with disabilities identified	9	77	209	**295**	

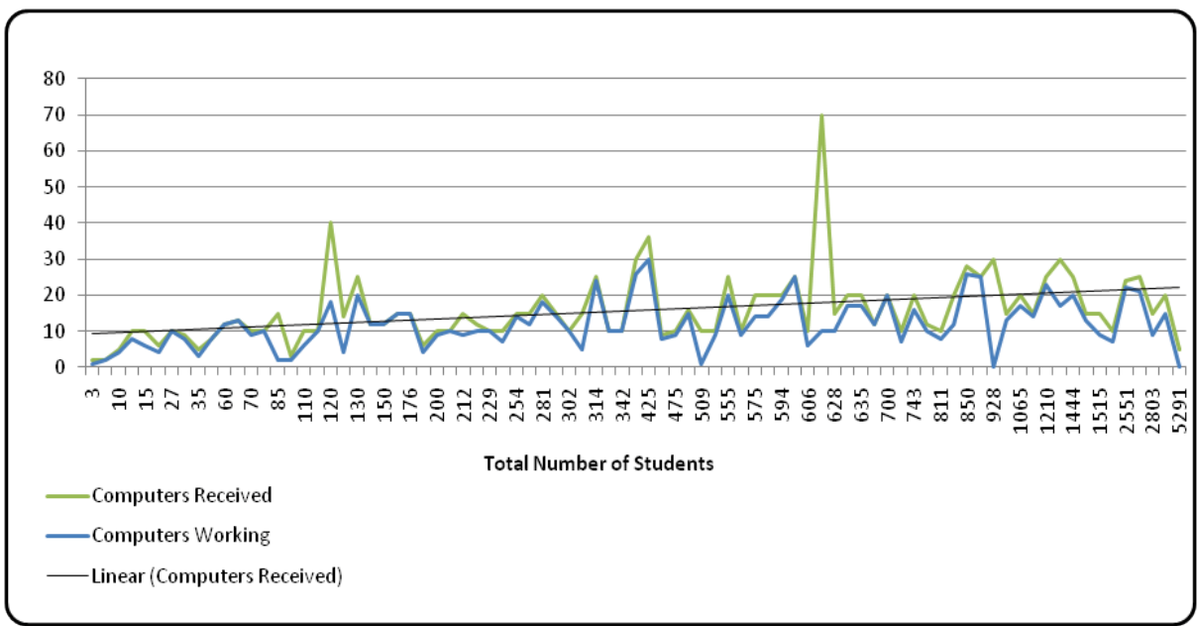
While the school visit target was lower than in 2009, the proportion achieved against target was considerably higher. The findings can thus be considered representative of the Camara schools in the three countries. Firstly, it is worth noting the wide variances in the basic performance of the Hubs as delivery organisations. Notwithstanding the deliberate intention to end the year with considerable stock, Uganda proved to be the most successful of the Hubs in terms of verifying its computer dispatch to schools, both proportionately and in absolute terms. It is also noteworthy that Zambian schools had a mean student number of more than double those of the other two Hubs. While the Hub achieved a higher beneficiary student number as a result, this figure is a double-edged sword since it also drives a much higher mean number of students per computer. The qualitative evidence and feedback from the Hubs suggests that only students in particular years are given access to the computers in many cases.

The biggest cause for concern is in Kenya, where of 1,334 computers received in 2009, only 301 (or 23%) were working in schools a year on. The Hub clearly had insufficient capacity to distribute the number of computers it received from Camara Education, and this underpinned many of the difficulties it encountered throughout the year. 107 computers were given to non-educational institutions, including two hospitals, a store, an NGO, and a cyber café. One school in Nairobi was given seventy computers and distributed all but ten of them to third parties, reportedly other schools. At 16%, a somewhat higher proportion of the computers were disbanded than in the other Hubs. The M&E Officers also struggled to conduct visits on a number of schools where the Hub's records had been incomplete or the relationship was limited and teachers refused to comply. This probably influenced the very high number of computers that went missing from its schools during the year (23%). The Hub found it difficult to produce a definitive list of its 2009 recipient schools, and needs significant support in terms of developing its own recording systems.

There is an enormous discrepancy in the numbers of students in the various institutions, ranging from 3 in a training centre in Uganda to over 5,000 at a community project in Kenya. The number of computers that institutions receive often seems more a function of their capacity to pay than their requirements, with a relatively low correlation between computers received and student numbers in each school. This is demonstrated by the black trend line in **Graph 1** below, where the schools are listed in order of increasing student numbers along the horizontal axis. The computers that were found to be working, and in the lab, at the time of the monitoring visit are also shown. Interestingly, schools that received a higher number of computers did not show a significantly higher breakage or

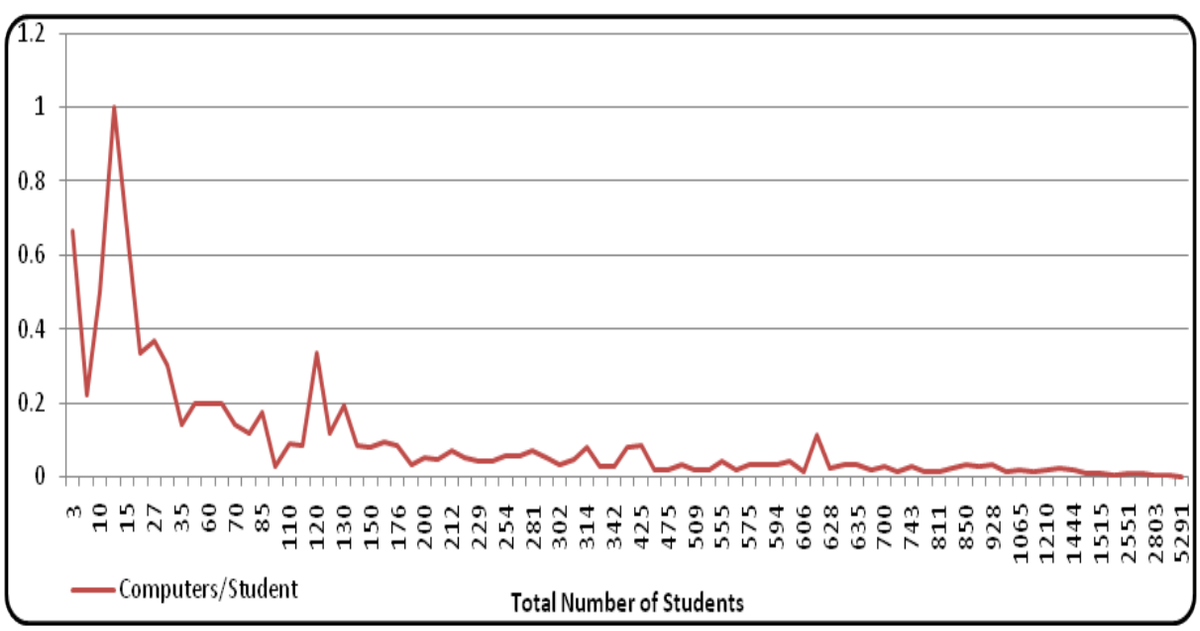
missing rate. The obvious exception was the Nairobi school that was given seventy computers.

Graph 1: Computers Received and Computers Working/ Total Number of Students



The upshot of the poor correlation between student numbers and computers received is that in the institutions with very high student numbers the level of access is so low as to be virtually meaningless. This is demonstrated quite starkly in **Graph 2**.

Graph 2: Computers per Student/ Total Number of Students



The gender balance is extremely equitable, with a slightly higher proportion of girls than boys in each of the three countries. While the student numbers given are likely to be estimates in nearly all cases, they do suggest a very positive trend. The relatively even split between primary, secondary, and other educational institutions is probably healthy. However, it does pose challenges in terms of tailoring the Edubuntu suite to very different markets. It is also positive to see a significant number of Community Education projects benefiting from the project, given that it likely facilitates access by people outside of formal education structures. That a high proportion of the schools were described as being rural by the M&E officers is certainly positive.

That almost half of the schools were public is certainly encouraging. While the significant drop in the proportion of schools that charge students for computer use was a positive finding, it was totally inexplicable and should be treated with a degree of scepticism. Interestingly, public schools were only marginally more likely to charge than private. The very substantial differences in the mean charges in the three countries is interesting, particularly given that one would expect the costs that accrue to schools in Zambia to be higher than those in Kenya.

The mean student usage per week[4] figure is useful, firstly insofar as it is relatively high; and secondly insofar as the means are so consistent with what one would expect to find across the three countries. The reported mean student usages in Kenya and Uganda are remarkably similar, as are their mean student numbers. Zambia, as one would expect given the much higher average number of students, had a lower reported level of student access. It is important to reemphasise that in many cases only students in particular years get access to the computers. The mean class times were also interesting in that they were remarkably constant across the three countries. The consistencies with regard to usage would suggest some reliability in the reports from teachers.

The mean weekly lab usage poses a significant challenge for the organisation. In every country there are institutions that reported using the computers on a virtually ongoing basis throughout the school-week. By contrast, the overall mean lab usage of less than ten hours represents a serious underutilisation of the technology hardware. By addressing this indicator alone, the programme could treble its efficacy. The M&E department should certainly investigate the reasons underpinning the low usage in 2011. A significant facet of the problem is the very large discrepancy between the reported usage in rural and urban schools, with rural schools using the labs for just 6.4 hours per week. This

4 Number of times a student gets to use the computers.

is possibly attributable to remote schools being less well-resourced and undergoing frequent power cuts. More research is patently needed in this area, though finding a definitive answer will certainly be challenging.

One major gap in the data is the proportion of students in each school who get regular access to the computers. However, by comparing the total number of minutes each computer is used on a weekly basis to the reported frequency of access and class length, we can estimate how many students the labs can reasonably cater for. For the average student who uses the lab to get nearly three classes per week, each at seventy minutes, the average lab could only cater for 48 students at current usage levels, assuming one student per computer. This represents only 7.5% of the students in Camara schools. Given that students seem to be paired in the majority of cases, the reality is probably that somewhat more students get access than this basic analysis would suggest. However, the almost inevitable conclusion is that the vast majority of students in Camara schools get very little access to the computers.

The proportion of PCs received by schools that were visited reveals a significant shortfall in the monitoring capacity of the organisation. While it represents 74% of the computers reportedly delivered to schools in the three countries which conducted school visits, some 3,128 (49%) of the 2009 computers were sent to countries which conducted no monitoring visits in 2010. In large part this was a function of the capacities of the Hubs on the back of a series of closures. Nonetheless, it is important that the proportion of 2010 computers visited are significantly higher across the network. The mean number of PCs received by schools was similar across the three countries, and significantly lower than that found in 2009. The feedback from the Uganda Hub was that this was driven by the schools' abilities to pay, the rationale being that it was better for a school to receive fifteen computers than none at all. While this certainly seems a reasonable approach, there is a clear need for more guidance from Camara Education in this regard.

The proportion of PCs broken after year one is roughly what one would expect based on the 2009 data. Furthermore, it is low relative to the breakage for new computers in their first year.[5] This should be seen as a major success for the organisation and its refurbishment process. What is interesting is how slight the correlation is between surge protection and breakage rates. Those schools that had surge protection had 14.1% of their computers broken at the time of the visit, for schools with no surge protection the figure

5 http://answers.google.com/answers/threadview/id/707813.html

was 15.3%.[6] The gap is likely to widen over subsequent years, but it is clear that from a school's perspective the cost of purchasing surge protection may not outweigh the benefits of reduced maintenance costs. In some cases it seems the schools are reasonably unfazed by a proportion of their computers breaking over time, in which case they are merely offsetting the cost of surge protection and maintenance against the overall efficacy of the programme.

The reports showed a bizarre correlation between schools that received maintenance and the numbers of broken computers. Schools that received maintenance had an average of 18% of their computers broken at the time of the visit, compared to 13% for schools that had not received maintenance. While there are possible explanations, there is definitely more work to do in researching this area for 2011 before making any conclusions. Another finding that runs contrary to what would have been expected was that the breakage rate for the 47 schools that had kept all of their computers running Linux was 16%. For the twelve schools that had installed Windows on all of their machines the breakage rate was 13.6%. 23 schools had both computers running Linux, and computers running Windows, and the breakage rate was 12%. Presumably the schools that can change their operating systems have a considerable level of in-house expertise and better-maintain their computers. This seems to offset the comparative stability of the Linux OS.

One shortfall of the M&E system stems from the fact that the M&E Officers conduct maintenance when they are in the schools. The online form did not distinguish between computers that were working when they arrived, and computers they were able to fix during the visit. This confounds the data somewhat and should be addressed in 2011. Nonetheless, there is seemingly no immediate positive correlation between Linux and maintenance visits, and the numbers of computers working after one year. The schools that received maintenance were asked both whether they were satisfied with service, and to rate their satisfaction numerically. If nothing else the responses betray flaws in the data, since Kenya had a low proportion of satisfied customers but a higher reported satisfaction rating, and Zambia was the reverse. A major concern is that the proportion of schools who received maintenance was so low across the three countries.

The statistics on PCs missing were particularly interesting, given the discrepancy between Kenya and the other two Hubs. While sixty of the missing computers were from the aforementioned school in Nairobi, the Kenyan schools still showed a proportion of

6 Of computers still in the Lab. Computers missing are not included in the total here as they are in the main matrix.

computers missing that was a multiple of those in the other two countries. Given the very stringent levels at which schools in Zambia were vetted, it is unsurprising that they had such a low number of computers stolen. However, it is difficult to reconcile this with such a high breakage rate, and it would be interesting to get feedback from the Hub as to where the discrepancy lies. Overall the Hubs seem to have enforced quite a high vetting-standard, with the exception being the prevalence of surge protection in Uganda, and to a lesser extent in Kenya.

A much higher proportion of schools had electricity than had been assumed based on anecdotal evidence. While this does highlight the limitations of a low-cost ICT for education project in targeting the very poor, it has very positive implications for the potential to vastly increase the number of hours a week the computers are used. There are almost certainly many students with disabilities who were not identified, though both the quantitative and qualitative data suggest that it is an issue that should be very much at the heart of the Camara programme.

3.1 Qualitative Data

3.1.1 Kenya

In 2009 the Kenya Hub focused on Mombasa, Lamu, Nairobi, Malindi and Ukunda. The Hub had quite a variety of customers, including an orphanage, six religious institutions, a training centre, a technical institute, and an institute of technology. Virtually all of the schools were mixed-religion; primarily Christian or Muslim, with some Hindus. Public schools were marginally more likely to charge students for computer access, but not to a degree that would warrant any additional action beyond continued monitoring. MITC in Mombasa charges its students 24,450 shillings (€203) per term, but it was clear that this is for the graduate programme rather than computer access. Similarly, the Mars institute for computer technology charges its students 8,000 shillings (€67) a month. Interestingly five of the schools do not seem to use their computers at all, four of which are rural.

The computers were received by schools between March and December 2009. The mean number of computers received was 15.5. At the time of the visits in 2010, a mean of just 9.7 computers were still working in the labs. Based on the feedback from students and teachers there seems to be a significant bias towards using computers for learning office based computer skills, to the neglect of using technology as a learning tool for the core curriculum. Six schools had students with identified disabilities, all of which were physical. Disabilities cited included limb loss, partial blindness and polio. In several cases this precluded the students from attending class. One recurring explanation for schools changing the operating system on their computers was that Linux is not thought to be examinable. Another explanation that was cited repeatedly was that teachers did not feel sufficiently trained to use Linux. One institution, the YWCA in Nairobi caters for women who have been abused.

3.1.2 Uganda

In 2009 the Uganda Hub focused on Fort Portal, Mubende, Kasese, Bundibugyo and Kagadi. The most common cited causes of computers breaking were hard disk failures and corrupt operating systems. As in the other two countries, there seems to have been several schools where the computers were barely used at all. The maintenance service offered to schools was clearly quite limited, since only seven reported having received it. There seems

to be enormous focus from the schools on Linux, and again it is clear that many teachers were not sufficiently trained to use it properly. Several schools reported using Tux Maths and Wikipedia, as well as a host of games.

77 students were identified as having disabilities in 16 (50%) of the Camara schools. Many were described as being lame, with others being at least partially blind or deaf. Schools emphasised the fact that the state does not provide funding for a computer teacher. In many cases teachers cannot get time off to attend training. The extent of the problem seems to have varied from district to district. The need to provide training at times that suit teachers in their own localities with a stronger customer-focus is evident. Teachers seem concerned with teaching the theory of computers, rather than using them as a learning tool. One school reportedly did not know that the computers were there to be used by the students prior to the visit. The M&E Officer emphasised in his reports that without training in Linux, schools will swap their computers to Windows, especially if the Hub does nothing to prevent it and word spreads throughout the locality. To date this does not seem to have been particularly problematic in Uganda however, with only 63 of the 2009 PCs running Windows and 449 running Linux.

3.1.3 Zambia

The Zambia Hub was only established in 2009, and the first batch of computers in that year was distributed by a local partner. The 2009 schools include eight basic schools, one home for physically disabled women, one missionary school, seven secondary schools, one university, and one religious institution. Nearly all the students were Christian, with some Muslims. Cheshire Home, the institute for disabled women, reported using the computers for five hour classes, 30 hours a week. All the computers were received in 2009, with a mean of 16.8 per school and a mode of 15. There seems to be some understanding among students of the potential for technology as a learning tool, with Tux Maths and Kanagram cited in particular. Students in one school reported sitting four to one chair and computer. Students suggested forming computer clubs so as to get more time with the computers. Several students reported feeling that they know more about computers than their teachers.

Teachers described Linux as being stable and affordable, though the majority reported having had no experience with it prior to Camara. Computers were considered to facilitate easier and faster teaching. They reported using Wikipedia, Tux Maths, Tux Paint, and KTouch. Computer literacy is considered a prerequisite to going to college or getting any job. Fear of being laughed at by other teachers was cited as another cause of resistance to learning how to use technology. Teachers also reported being embarrassed when students ask questions about computers that they cannot answer. One teacher reported having a degree in computer science, and uses the computers for teaching geography, computer studies, agriculture, science, and art. Teachers requested more local training, particularly during the holidays. Some teachers were unhappy with the fact that training is currently held during the school day so they cannot attend. They also emphasised the need for it to be advertised to schools. One teacher suggested a Camara magazine that could be circulated to schools with upcoming training dates, and that the teachers themselves could contribute to. Another requested a more advanced education package. Several schools reported using their computers for research.

Teachers reported students learning new things every day through technology, with the games and educational materials being particularly useful. Two of the schools were institutions for people living with disabilities, together catering for 188 students. In the remaining 18 schools, 21 people living with disabilities were identified, with hearing, visual and learning impairments. The M&E officers commented that the training offered by Camara seems too short, and that several schools were rude and unhelpful. Again, buy-in to the programme and training in Linux were seen as being critical to its success.

4. Hub Audits

Scores

Rank	Organisation	Score	2009
1	Camara Education	87%	57%
2	Camara Zambia	75%	N/A
3	Camara Uganda	72%	52%
4	Camara Kenya	49%	62%
	Mean	71%	57%

4.1 Camara Education 2010 Hub Audit

Summary Audit	Score	Total	Percentage
Training Programme	N/A	0	0%
Volunteer Programme	4	6	60%
TEL	4	6	60%
Core Hardware Outputs	12	15	79%
Vetting, Shipping and Site Audit	5	6	86%
Fulfilment and affordability	6	6	93%
Hardware Delivery and Support	23	27	84%
M&E	12	15	82%
Reporting and Finance	5	6	90%
Staffing, Communication and Governance	7	8	94%
Management and Governance	25	29	87%
Total	51	62	83%

4.1.1 TEL

	Percentage	Coefficient	Score
Training	N/A	0	0
Training Programme		0	0
Domestic Volunteer Programme	N/A	0	0
International Volunteer Programme	60%	6	3.6
Volunteer Programme		6	3.6
Technology-enhanced Learning	60%	6	3.6

4.1.1.1 Training

No suitable metric was established for evaluation Camara Education's training function.

4.1.1.2 Domestic Volunteer Programme

This criterion was not evaluated for any of the Hubs for 2010.

4.1.1.3 International Volunteer Programme

This score was based on the international volunteers' evaluations of the support they received from the Camara Education. The volunteers were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Excellent (5 points)

ii) Very Good (4 points)

iii) Good (3 points)

iv) Average (2 points)

v) Not Very Good (1 point)

vi) Poor (0 points)

vii) No Experience (not included in the evaluation)

The scores given by volunteers are shown in percentage form on the grid below. Additional comments from volunteers are available to the Hub on request. Where a volunteer ticked two boxes for one criterion the score was split between those fields for scoring purposes.

	Excellent	Very Good	Good	Average	Not Very Good	Poor	No Experience	Responses	Total
Organising the visit	6%	19%	44%	19%	0%	13%	0%	16	16%
Providing information prior to travel	6%	22%	44%	17%	11%	0%	0%	18	18%
Personal support given to you	31%	6%	31%	19%	0%	13%	0%	16	16%
Helpfulness and Friendliness	44%	31%	13%	6%	6%	0%	0%	16	16%
Communication during your visit	6%	6%	31%	19%	19%	13%	6%	16	16%
Support and feedback after your visit	6%	13%	31%	25%	6%	13%	6%	16	16%

4.1.2 Hardware

Hardware Delivery and Support	Percentage	Coefficient	Score
Dispatch	44%	5	2.2
Refurbishment	94%	5	4.7
Recycling	100%	5	5.0
Core Hardware Outputs		15	11.9
Vetting	N/A	0	0.0
Shipping	80%	3	2.4
Health, Safety and Security Site Audit	92%	3	2.8
Vetting, shipping, and site audit		6	5.2
Hardware and Software	85%	3	2.6
Mark-Up Price/ Affordability	100%	3	3.0
Fulfilment and affordability		6	5.6
Hardware Delivery and Support	84%	27	22.6

4.1.2.1 Dispatch

The Hub dispatched 4,365 computers, or 44% of its annual target.

4.1.2.2 Refurbishment

The Hubs were asked to report the proportion of their computers that were broken on arrival. The score given is the aggregate of the responses from four Hubs.

4.1.2.3 Recycling

The Dublin Hub recycled all of the computers it received that were unsuitable for dispatch.

4.1.2.4 Vetting

This criterion was not deemed relevant for Camara Education.

4.1.2.5 Shipping

The Receiving Hubs were asked to rate the professionalism of the Dublin Hub in coordinating their shipments out of ten. The score given is the mean from four Hubs.

4.1.2.6 Health, Safety and Security Site Audit

The Hub was audited for Health, Safety and Security on-site.

4.1.2.7 Hardware and Software

The Hubs were asked to rate the computer hardware and software they received from the Dublin Hub. The responses were quantified and aggregated to arrive at the given score.

4.1.2.8 Mark-Up Price/Affordability

The Receiving Hubs were given their PCs as a benefit-in-kind in 2010.

4.1.3 Management and Governance

Management and Governance	Percentage	Coefficient	Score
M&E	82%	15	12.3
M&E		15	12.3
Reporting and Documentation	N/A	0	0.0
Quality and timeliness of financial reporting	N/A	0	0.0
Financial Efficiency	80%	3	2.4
Financial Sustainability	N/A	0	0.0
External Audit	100%	3	3.0
Reporting and Finance		6	5.4
Staffing profile	N/A	0	0.0
Camara Dublin communication with Hubs	83%	1.5	1.2
Camara ASC communication with Hubs	83%	1.5	1.2
Minuted Board Meetings	100%	3	3.0
Adherence to tax and legal obligations	100%	2	2.0
Staffing, Communication and Governance		8	7.5
Management and Governance	87%	29	25.2

4.1.3.1 M&E

The score allocated was the aggregated percentage of schools for which M&E reports were submitted in 2010 against target.

4.1.3.2 Reporting and Documentation

This criterion was not evaluated for Camara Education

4.1.3.3 Quality and Timeliness of Financial Reporting

This criterion was not evaluated for Camara Education.

4.1.3.4 Financial Efficiency

This criterion was awarded based on a cost/benefit analysis. Camara Education showed a return of 15.9% for the year. This was marked against a maximum reasonable return estimate of 20%.

4.1.3.5 Financial Sustainability

This criterion was not evaluated for Camara Education.

4.1.3.6 External Audit

The Hub commissioned an external audit for the year.

4.1.3.7 Staffing Profile

This criterion was not evaluated for 2010.

4.1.3.8 Communication with the Receiving Hubs

This score was based on Receiving Hub evaluations of quality of the communication they received from Camara Education. Staff were asked to rate Camara Dublin and the Africa Services Centre on a selection of criteria. The scoring options given were:

i) Very Good (5 points)

ii) Good (4 points)

iii) Neutral (3 points)

iv) Bad (2 point)

v) Very Bad (1 points)

vi) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from staff are available to the Hub on request.

Camara Dublin

	Very Good	Good	Neutral	Poor	Very Poor
Promptness in replying	2	1	1		
Helpfulness	3		1		
Friendliness	3	1			
Expertise	2	2			
Listening	2	1	1		

Africa Services Centre

	Very Good	Good	Neutral	Poor	Very Poor
Promptness in replying	1	1	1		
Helpfulness	2	1			
Friendliness	1	2			
Expertise	1	2			
Listening	2		1		

4.1.3.9 Minuted Board Meetings

The Hub had four minuted board meetings in the year.

4.1.3.10 Adherence to Tax and Legal Obligations.

The Hub was found to have adhered to its tax obligations for 2010 by the external auditors.

4.2 Kenya 2010 Hub Audit

Summary Audit	Score	Total	Percentage
Training Programme	8	18	47%
Volunteer Programme	4	6	60%
TEL	12	24	50%
Core Hardware Outputs	2	5	45%
Vetting, Shipping and Site Audit	4	6	72%
Fulfilment and affordability	N/A	0	0%
Hardware Delivery and Support	7	11	59%
M&E	11	15	76%
Reporting and Finance	2	15	10%
Staffing, Communication and Governance	4	8	53%
Management and Governance	17	38	45%
Total	36	73	49%

4.2.1 TEL

	Percentage	Coefficient	Score
Training	47%	18	8.46
Training Programme		18	8.46
Domestic Volunteer Programme	N/A	0	0
International Volunteer Programme	59%	6	3.6
Volunteer Programme		6	3.6
Technology-enhanced Learning	50%	24	12.06

4.2.1.1 Training

The Hub trained 134 teachers in basic ICT (54% of target) and 40 people in the ICT Technician course (40% of target).

4.2.1.2 Domestic Volunteer Programme

This criterion was not evaluated for any of the Hubs for 2010.

4.2.1.3 International Volunteer Programme

This score was based on the international volunteers' evaluations of the support they received from the local Hub. The volunteers were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Excellent (5 points)

ii) Very Good (4 points)

iii) Good (3 points)

iv) Average (2 points)

v) Not Very Good (1 point)

vi) Poor (0 points)

vii) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from volunteers are available to the Hub on request. Where a volunteer ticked two boxes for one criterion the score is split between those fields.

	Excellent	Very Good	Good	Neutral	Not Very Good	Poor	N/A
Bringing teachers to be trained				1	3	1	
Organising the logistics of the training		1	1	2	1		
Personal support given to you	1	1	2	1			
Providing you with information during your visit	1	1	1	2	1		
Helpfulness and friendliness	4		1				

4.2.2 Hardware

Hardware Delivery and Support	Percentage	Coefficient	Score
Dispatch	45%	5	2.3
Maintenance	N/A	0	0.0
Recycling	N/A	0	0.0
Core Hardware Outputs		5	2.3
Vetting	74%	3	2.2
Shipping	N/A	0	0.0
Health, Safety and Security Site Audit	69%	3	2.1
Vetting, shipping, and site audit		6	4.3
Fulfilment	N/A	0	0.0
Mark-Up Price/ Affordability	N/A	0	0.0
Fulfilment and affordability		0	0.0
Hardware Delivery and Support	59%	11	6.5

4.2.2.1 Dispatch

The Hub delivered 560 computers to schools, or 45% of its annual target.

4.2.2.2 Maintenance

This criterion was not included for the 2010 audit.

4.2.2.3 Recycling

This criterion was not included for the 2010 audit.

4.2.2.4 Vetting

This criterion was scored based on the vetting data from the 2010 M&E visits to 2009 schools. The mean of the percentages below was given as the overall score.

Labs with surge protection	16
Surge protection (%)	52%
Labs with adequate ventilation and light	27
Ventilation and light (%)	87%
Labs with a steel door	23
Steel door (%)	74%
Labs with grilled windows	26
Grilled windows (%)	84%

4.2.2.5 Shipping

This criterion was not included for the 2010 audit.

4.2.2.6 Health, Safety and Security Site Audit

The Hub has received its report for the site audit separately.

4.2.2.7 Fulfilment

This criterion was not included for the 2010 audit since the response rate from schools to the online survey was too low to evaluate it properly.

4.2.2.8 Mark-Up Price/Affordability

This criterion was not included for 2010 since it was not included in the Hub agreements.

4.2.3 Management and Governance

Management and Governance	Percentage	Coefficient	Score
M&E	76%	15	11.4
M&E		15	11.4
Reporting and Documentation	0%	3	0.0
Quality and timeliness of financial reporting	0%	3	0.0
Financial Efficiency	0%	3	0.0
Financial Sustainability	0%	3	0.0
External Audit	50%	3	1.5
Reporting and Finance		15	1.5
Staffing profile	N/A	0	0.0
Communication With Camara Education	66%	3	2.0
Minuted Board Meetings	75%	3	2.3
Adherence to tax and legal obligations	N/A	2	0.0
Staffing, Communication and Governance		8	4.2
Management and Governance	45%	38	17.1

4.2.3.1 M&E

The score allocated was the percentage of schools for which M&E reports were submitted in 2010 against target.

4.2.3.2 Reporting and Documentation

Whilst board meetings are reported to have occurred no minutes were produced or are recorded on file. Mandatory weekly reports introduced in the last quarter from the hub to the Africa Service Centre were not produced.

4.2.3.3 Quality and Timeliness of Financial Reporting

An external accountancy firm was contracted to this hub in an effort to produce monthly accounts. In 2010, the board discontinued the services of the accountancy firm. An external financial audit was conducted however it was not signed off by the board as the board did not have confidence in the exercise conducted.

4.2.3.4 Financial Efficiency

The cash position of the hub at the end of 2010 was considered weak by the board.

4.2.3.5 Financial Sustainability

Without continued subsidised PCs the hub would not have been financially sustainable in 2010.

4.2.3.6 External Audit

The Hub was expected to commission an external audit for the year. While this was done, it was not signed off by the board.

4.2.3.7 Staffing Profile

This criterion was not evaluated for 2010.

4.2.3.8 Communication with Camara Education

This score was based on Camara Education staff evaluations of quality of the communication they received from the Hub. Staff were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Very Good (5 points)

ii) Good (4 points)

iii) Neutral (3 points)

iv) Bad (2 point)

v) Very Bad (1 point)

vi) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from staff are available to the Hub on request.

	Very Good	Good	Neutral	Bad	Very Bad	No experience
Promptness in replying	1	1	2	1		
Helpfulness	1	1	1	1	1	
Friendliness		3	1		1	
Expertise	1	3		1		
Listening	1	1	2		1	

4.2.3.9 Minuted Board Meetings

Two minuted board meetings both in the last quarter. Whilst board meetings are said to have taken place in the first half of the year, no minutes were available.

4.2.3.10 Adherence to Tax and Legal Obligations.

The Hub was found not to have adhered to its tax obligations for 2010.

4.3 Uganda 2010 Hub Audit

Summary Audit	Score	Total	Percentage
Training Programme	12	18	68%
Volunteer Programme	4	6	67%
TEL	16	24	67%
Core Hardware Outputs	2	5	41%
Vetting, Shipping and Site Audit	4	6	66%
Fulfilment and affordability	N/A	0	0%
Hardware Delivery and Support	6	11	55%
M&E	14	15	94%
Reporting and Finance	9	9	100%
Staffing, Communication and Governance	5	8	68%
Management and Governance		32	89%
Total	51	70	72%

4.3.1 TEL

	Percentage	Coefficient	Score
Training	68%	18	12.15
Training Programme		18	12.15
Domestic Volunteer Programme	N/A	0	0
International Volunteer Programme	67%	6	4.02
Volunteer Programme		6	4.14
Technology-enhanced Learning	67%	24	16.29

4.3.1.1 Traning

The Hub trained 397 teachers in basic ICT (159% of target) and 35 people in the ICT Technician course (35% of target).

4.3.1.2 Domestic Volunteer Programme

This criterion was not evaluated for any of the Hubs for 2010.

4.3.1.3 International Volunteer Programme

This score was based on the international volunteers' evaluations of the support they received from the local Hub. The volunteers were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Excellent (5 points)

ii) Very Good (4 points)

iii) Good (3 points)

iv) Average (2 points)

v) Not Very Good (1 point)

vi) Poor (0 points)

vii) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from volunteers are available to the Hub on request. Where a volunteer ticked two boxes for one criterion the score is split between those fields.

	Excellent	Very Good	Good	Average	Not Very Good	Poor	N/A
Bringing teachers to be trained		2		3			
Organising the logistics of the training	0.5	0.5	2	2			
Personal support given to you	2	2		1			
Providing you with information during your visit		2	2		1		
Helpfulness and friendliness	4		1				

4.3.2 Hardware

Hardware Delivery and Support	Percentage	Coefficient	Score
Dispatch	41%	5	2.1
Maintenance	N/A	0	0.0
Recycling	N/A	0	0.0
Core Hardware Outputs		5	2.1
Vetting	66%	3	2.0
Shipping	N/A	0	0.0
Health, Safety and Security Site Audit	66%	3	2.0
Vetting, shipping, and site audit		6	3.9
Fulfilment	N/A	0	0.0
Mark-Up Price/ Affordability	N/A	0	0.0
Fulfilment and affordability		0	0.0
Hardware Delivery and Support	55%	11	6.0

4.3.2.1 Dispatch

The Hub delivered 509 computers to schools, or 41% of its annual target.

4.3.2.2 Maintenance

This criterion was not included for the 2010 audit.

4.3.2.3 Recycling

This criterion was not included for the 2010 audit.

4.3.2.4 Vetting

This criterion was scored based on the vetting data from the 2010 M&E visits to 2009 schools. The mean of the percentages below was given as the overall score.

Labs with surge protection	9
Surge protection (%)	28%
Labs with adequate ventilation and light	25
Ventilation and light (%)	78%
Labs with a steel door	25
Steel door (%)	78%
Labs with grilled windows	25
Grilled windows (%)	78%

4.3.2.5 Shipping

This criterion was not included for the 2010 audit

4.3.2.6 Health, Safety and Security Site Audit

The Hub has received its report for the site audit separately.

4.3.2.7 Fulfilment

This criterion was not included for the 2010 audit since the response rate from schools to the online survey was too low to evaluate it properly.

4.3.2.8 Mark-Up Price/Affordability

This criterion was not included for 2010 since it was not included in the Hub agreements.

4.3.3 Management and Governance

Management and Governance	Percentage	Coefficient	Score
M&E	94%	15	14.1
M&E		15	14.1
Reporting and Documentation	100%	3	3.0
Quality and timeliness of financial reporting	100%	3	3.0
Financial Efficiency	100%	3	3.0
Financial Sustainability	0%	3	0.0
External Audit	N/A	0	0.0
Reporting and Finance		12	9.0
Staffing profile	N/A	0	0.0
Communication With Camara Education	79%	3	2.4
Minuted Board Meetings	33%	3	1.0
Adherence to tax and legal obligations	100%	2	2.0
Staffing, Communication and Governance		8	5.4
Management and Governance	81%	35	28.5

4.3.3.1 M&E

The score allocated was the percentage of schools for which M&E reports were submitted in 2010 against target.

4.3.3.2 Reporting and Documentation

The Ugandan hub provided regular management reports to ASC and met the criteria for minuted board meetings.

4.3.3.3 Quality and Timeliness of Financial Reporting

Regular financial reporting was in place for 2010.

4.3.3.4 Financial Efficiency

The hub managed its cash flow well in 2010 and met its financial obligations throughout the year without a grant from Camara Education.

4.3.3.5 Financial Sustainability

As the hub was not in a position to receive PCs beyond March 2010 this criteria was discounted.

4.3.3.6 External Audit

The Hub was not expected to have an external audit report done for the year and this criterion has not been evaluated.

4.3.3.7 Staffing Profile

This criterion was not evaluated for 2010.

4.3.3.8 Communication with Camara Education

This score was based on Camara Education staff evaluations of quality of the communication they received from the Hub. Staff were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Very Good (5 points)

ii) Good (4 points)

iii) Neutral (3 points)

iv) Bad (2 point)

v) Very Bad (1 points)

vi) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from staff are available to the Hub on request.

	Very Good	Good	Neutral	Bad	Very Bad	No experience
Promptness in replying	2	1	1	1		
Helpfulness	1	4				
Friendliness	3	2				
Expertise	1	1	1	1		1
Listening	1	2	1			1

4.3.3.9 Minuted Board Meetings

No minutes of board meetings however one board report was produced in 2010.

4.3.3.10 Adherence to Tax and Legal Obligations.

The Hub was deemed fully adherent to its tax obligations as of the end of 2010.

4.4 Zambia 2010 Hub Audit

Summary Audit	Score	Total	Percentage
Training Programme	18	18	100%
Volunteer Programme	3	6	57%
TEL	21	24	89%
Core Hardware Outputs	4	5	76%
Vetting, Shipping and Site Audit	5	6	82%
Fulfilment and affordability	0	0	0%
Hardware Delivery and Support	9	11	79%
M&E	12	15	80%
Reporting and Finance	6	12	49%
Staffing, Communication and Governance	5	8	56%
Management and Governance	22	35	64%
Total	52	70	75%

4.4.1 TEL

	Percentage	Coefficient	Score
Training	100%	18	18
Training Programme		18	18
Domestic Volunteer Programme	N/A	0	0
International Volunteer Programme	57%	6	3.42
Volunteer Programme		6	3.42
Technology-enhanced Learning	89%	24	21.42

4.4.1.1 Training

The Hub trained 484 teachers in basic ICT (194% of target) and 279 people in the ICT Technician course (279% of target).

4.4.1.2 Domestic Volunteer Programme

This criterion was not evaluated for any of the Hubs for 2010.

4.4.1.3 International Volunteer Programme

This score was based on the international volunteers' evaluations of the support they received from the local Hub. The volunteers were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Excellent (5 points)

ii) Very Good (4 points)

iii) Good (3 points)

iv) Average (2 points)

v) Not Very Good (1 point)

vi) Poor (0 points)

vii) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from volunteers are available to the Hub on request.

	Excellent	Very Good	Good	Average	Not Very Good	Poor	N/A
Bringing teachers to be trained	2	1	2			1	
Organising the logistics of the training				2	3	1	
Personal support given to you		3	2		1		
Providing you with information during your visit		1	3	1		1	

4.4.2 Hardware

Hardware Delivery and Support	Percentage	Coefficient	Score
Dispatch	76%	5	3.8
Maintenance	N/A	0	0.0
Recycling	N/A	0	0.0
Core Hardware Outputs		5	3.8
Vetting	88%	3	2.6
Shipping	N/A	0	0.0
Health, Safety and Security Site Audit	76%	3	2.3
Vetting, shipping, and site audit		6	4.9
Fulfilment	N/A	0	0.0
Mark-Up Price/ Affordability	N/A	0	0.0
Fulfilment and affordability		0	0.0
Hardware Delivery and Support	79%	11	8.7

4.4.2.1 Dispatch

The Hub delivered 952 computers to schools, or 76% of its annual target.

4.4.2.2 Maintenance

This criterion was not included for the 2010 audit.

4.4.2.3 Recycling

This criterion was not included for the 2010 audit.

4.4.2.4 Vetting

This criterion was scored based on the vetting data from the 2010 M&E visits to 2009 schools. The mean of the percentages below was given as the overall score.

Labs with surge protection	16
Surge protection (%)	80%
Labs with adequate ventilation and light	18
Ventilation and light (%)	90%
Labs with a steel door	18
Steel door (%)	90%
Labs with grilled windows	18
Grilled windows (%)	90%

4.4.2.5 Shipping

This criterion was not included for the 2010 audit.

4.4.2.6 Health, Safety and Security Site Audit

The Hub has received its report for the site audit separately.

4.4.2.7 Fulfilment

This criterion was not included for the 2010 audit since the response rate from schools to the online survey was too low to evaluate it properly.

4.4.2.8 Mark-Up Price/Affordability

This criterion was not included for 2010 since it was not included in the Hub agreements.

4.4.3 Management and Governance

Management and Governance	Percentage	Coefficient	Score
M&E	80%	15	12.0
M&E		15	12.0
Reporting and Documentation	50%	3	1.5
Quality and timeliness of financial reporting	25%	3	0.8
Financial Efficiency	70%	3	2.1
Financial Sustainability	50%	3	1.5
External Audit	N/A	0	0.0
Reporting and Finance		12	5.9
Staffing profile	N/A	0	0.0
Communication With Camara Education	69%	3	2.3
Minuted Board Meetings	75%	3	2.3
Adherence to tax and legal obligations	0%	2	0.0
Staffing, Communication and Governance		8	4.5
Management and Governance	64%	35	22.4

4.4.3.1 M&E

The score allocated was the percentage of schools for which M&E reports were submitted in 2010 against target.

4.4.3.2 Reporting and Documentation

The Hub's cash position was not provided in its management reports, but was made available to the board on request. The chair awarded a score of 50% on this basis.

4.4.3.3 Quality and Timeliness of Financial Reporting

Financial reports were made available upon request.

4.4.3.4 Financial Efficiency

Management forecast a cash position of €20,000 at the end of the financial year. The actual was €14,000, or 75% of this.

4.4.3.5 Financial Sustainability

The Hub was considered capable of sustaining itself without external assistance for three months at the end of the year.

4.4.3.6 External Audit

The Hub was not expected to have an external audit report done for the year and the criterion has not been evaluated.

4.4.3.7 Staffing Profile

This criterion was not evaluated for 2010.

4.4.3.8 Communication with Camara Education

This score was based on Camara Education staff evaluations of quality of the communication they received from the Hub. Staff were asked to rate the Hub on a selection of criteria. The scoring options given were:

i) Very Good (5 points)

ii) Good (4 points)

iii) Neutral (3 points)

iv) Bad (2 point)

v) Very Bad (1 points)

vi) No Experience (not included in the evaluation)

The scores given by volunteers are listed on the grid below. Additional comments from staff are available to the Hub on request.

	Very Good	Good	Neutral	Bad	Very Bad	No experience
Promptness in replying	1	2		1	1	
Helpfulness	1	2	2			
Friendliness	4		1			
Expertise	1	2	1		1	
Listening	1	2	2			

4.4.3.9 Minuted Board Meetings

Three of the four board meetings were conducted and minuted.

4.4.3.10 Adherence to Tax and Legal Obligations.

The Hub was found not to have adhered to its tax obligations for 2010.

5. The Evidence on ICT in Education:
A review of the existing randomised controlled trials (RCTs)

The purpose of this paper is to briefly summarise the best available evidence on ICT in education, particularly with a view to determining what has been demonstrated to work and where the major obstacles occur. The evidence is particularly important for an organisation working in ICT in education for two reasons: Firstly, the RCTs that have been conducted give a good indication as to what constitutes a quality model and what is likely to fail, facilitating learning from the successes and mistakes of other interventions. Secondly, while ICT in education has attracted substantial investment in both developed and developing countries, by and large the money has not followed the evidence. If government expenditure decisions do become more evidence-based in the coming years, organisations will come under increasing pressure to justify their projects to ensure continued funding. While still relatively rare, strong arguments have been made against ICT in education from informed commentators.[7]

This review will almost exclusively rely on the evidence from randomised controlled trials (RCTs) since they are widely considered to be the most rigorous and scientific form of study. Essentially an RCT involves doing a baseline study and randomly assigning participants to one of two groups. The first group receives the intervention (ICT in education), whereas the second is used as a control group against which to measure outcomes from the trial. While some 15 million RCTs have been conducted in medicine, where they are considered the 'gold-standard' in the hierarchy of evidence, there is far less comparable evidence available on education.[8] Furthermore, 'while ICT programs are one of the most studied interventions in the education literature, robust evaluations of ICT programs are still too scarce to provide general conclusions regarding their effectiveness. The results that do exist are at best mixed'.[9] The table below cites seven of the most widely-cited and relevant studies in the field from the past decade.

7 http://edutechdebate.org/ict-in-schools/there-are-no-technology-shortcuts-to-good-education/
8 www.hse.ie, www.bmj.com, Accessed 7th June 2011.
9 Barrera-Osorio and Linden, *The Use and misuse of Computers in Education: Evidence from a Randomized Controlled Trial of a Language Arts Program'*, p 1.

Table 1: Studies on ICT in Education

	Study	Type	Location	Subject	Group	Positive	No impact	Negative
1a	**Angrist and Lavy (2001)**	CG	Israel	Hebrew Literacy	4th & 8th Grades		☒	
1b	**Angrist and Lavy (2001)**	CG	Israel	Maths	4th & 8th Grades			☒
2a	**Rouse and Krueger (2004)**	RCT	Northeast US	Reading	3rd-6th Grades		☒	
2b	**Rouse and Krueger (2004)**	RCT	Northeast US	Language	3rd-6th Grades		☒	
3a	**Brooks et al (2006)**	RCT	North England	Spelling	Secondary (11-12)		☒	
3b	**Brooks et al (2006)**	RCT	North England	Reading	Secondary (11-12)			☒
4	**Banjeree et al (2007)**	RCT	Vadodara and Mumbai, India	Maths	3rd and 4th Grades	☒		
5a	**Linden (2008)**	RCT	Gujarat, India	Maths Substitute	Primary school			☒
5b	**Linden (2008)**	RCT	Gujarat, India	Maths Compliment	Primary school	☒		
6	**He, Linden and McLeod (2008)**	RCT	Maharashtra, India	English Language	Primary (6-9)	☒		
7a	**Barrera-Osorio and Linden (2009)**	RCT	Columbia	Maths	Basic, 2nd & 3rd		☒	
7b	**Barrera-Osorio and Linden (2009)**	RCT	Columbia	Spanish	Basic, 2nd & 3rd		☒	

1. Angrist and Lavy: New Evidence on Classroom Computers and Pupil Learning (2001).

While it is the only study included here that was not an RCT, the Angrist and Lavy paper has been hugely influential ever since its publication. The study was an attempt to evaluate the impact of the Tomorrow-98 programme in Israel, which was funded by the state lottery and sponsored the installation of 35,000 computers in schools during the mid-1990s. The project was a prime example of an unfocused intervention that assumed that more computers would translate into better educational outcomes with little additional supports. The Angrist and Lavy study essentially compared the literacy and maths capacities of students in schools that had benefited from the programme with those that had not. They found that in both the 4th and 8th grades the programme achieved no benefits for students in Hebrew literacy, and had a negative impact on maths scores.

2. Rouse and Krueger: Putting Computerized Instruction to the Test: A Randomized Evaluation of a "Scientifically-Based" Reading Program (2004).

Rouse and Krueger conducted their study in the United States, stressing that 'although schools across the country are investing heavily in computers in the classroom, there is surprisingly little evidence that they actually improve student achievement'. The objective of the study was to evaluate the impact of 'a well-defined use of computers in schools: a popular instructional computer program, known as *Fast ForWord*, which is designed to improve language and reading skills'.[10] *Fast ForWord* is particularly interesting since it is a high-end proprietary program, which costs schools $30,000 a year for a license. While the authors concluded that the package helped with some very specific language skills, it did not translate into language competency more broadly. The program was found to have had no impact on reading abilities.

3. Brooks, Miles, Torgerson and Torgerson: Is an Intervention Using Computer Software Effective in Literacy Learning? A Randomised Controlled Trial (2006).

The Brooks et al study evaluated an intervention in a school in the North of England

10 Rouse and Krueger, *Putting Computerized Instruction to the Test: A Randomized Evaluation of a "Scientifically-Based" Reading Program,* p 1.

that delivered 10 hours of literacy learning on laptop computers to students aged 11-12. The evaluation found that the project had made no impact on literacy skills, and for reading skills had been harmful. The authors concluded that 'all new literacy software needs to be tested in a rigorous trial before it is used routinely in schools'.[11]

4. Banjeree, Cole, Duflo and Linden: Remedying Education: Evidence from Two Randomized Experiments in India (2007).

The Banjeree et al paper was the first reliable study published on ICT in education in a developing country. Furthermore, it showed that students using computerised maths games showed significantly improved capacities relative to the control group (0.47 standard deviation). The study was an evaluation of a project run by Pratham, a large NGO in India. In the target schools students had previously received four hours of tuition per day. The intervention involved two hours of shared practice time per week, one hour during school time and one hour directly before or afterwards. The games responded to students' abilities to solve them, and were tailored to reinforce what students had been taught by their teachers. Stronger and weaker students benefited equally from the intervention. While students were supported during the lessons, they received no additional instruction beyond the games in these classes. The games used were a combination of off the shelf and specially developed software. The programme was delivered for $15.18 per student per year.

5. Linden: Complement or Substitute? The Effect of Technology on Student Achievement in India (2008).

Leigh Linden's study focuses on an NGO called Gyan Shala in Gujarat, India. The experiment explicitly set out to test the effectiveness of the programme both as a substitute to regular tuition and as a complement by using the computers outside school hours. Where regular tuition was substituted, student performance in maths fell significantly (-0.57 standard deviations). By contrast, where the programme was taught outside regular class time, students' test scores showed a small but statistically significant improvement (0.28 standard deviations). The programme showed stronger gains for poorer-performing and older students, who achieved gains of 0.4 and 0.69 standard deviations.

11 Brooks, Miles, Torgerson and Torgerson, *Is an Intervention Using Computer Software Effective in Literacy Learning? A Randomised Controlled Trial,* p 1.

6. He, Linden and MacLeod: How to teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program (2008).

The He et al study examined a second project run by Pratham, which used specialised computer equipment as part of an intervention to teach students English in Maharashtra, India. The study found that the computer-aided component of the project had a positive impact, though the results were matched when the intervention relied on teacher-based tuition using flashcards and teachers' manuals. Interestingly weaker students were found to have benefited more from teacher-directed learning, whereas higher-performing students benefitted more from the self-paced computer-aided intervention.

The study is particularly strong in terms of analysing the cost-benefit of the computer-based activities compared to the more low-tech alternatives. The researchers found that when administered internally and amortized over five years, the costs per tenth of a standard deviation were $1.00 (machine only), $0.22 (activities only), and $1.05 (both). While these approaches are 'particularly cheap' compared to other educational interventions in similar contexts, it is safe to conclude that the technology was not worth the additional cost in this instance. The finding that delivering the programme internally was much more cost-effective suggests that 'equipping teachers with the appropriate tools and learning methods can be more effective than delivering similar interventions through outside agencies'.[12]

7. Barrera-Osorio and Linden: The Use and Misuse of Computers in Education: Evidence from a Randomized Controlled Trial of a Language Arts Program (2009).

This study focuses on the Computers for Education programme in Colombia. The programme refurbishes computers donated by the private sector, and attempts to integrate them into language tuition in public schools. The model was designed and run by Universidad de Antioquia and was relatively sophisticated, partnering schools with local universities. The programme itself is enormous, having refurbished 73,665 computers and installed labs in 6,386 schools. The trial was easily one of the largest conducted in the area, with a sample of 97 schools and 5,201 students. The study found that the programme

12 He, Linden and MacLeod, *How to teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program (2008)*, pp 47-49.

had achieved no statistically-significant impact. Based on teachers and student survey data, the researchers attributed this finding to a failure by teachers to incorporate computers into their curriculum, despite focused training in the pedagogy of ICT. Startlingly, only 3 to 4 percent of students in both the treatment and control groups reported using the computers in language class.[13]

Primary Findings

1. Merely installing computer labs in schools is unlikely to achieve any educational benefit.
2. Even the most upmarket proprietary software in rich countries has shown mixed success.
3. Educational games used to reinforce and practice what has been taught in the classroom can have a positive impact on student learning outcomes.
4. However, computers should be used outside of normal tuition hours. If computers replace teacher-based tuition they have consistently had a negative impact on outcomes.
5. Where computer-aided learning has been shown to have been beneficial the same activities may be replicable without technology, and at much lower cost.
6. Even when teachers are trained to integrate computers into their teaching; they are far more likely to use them to teach students to use computers.

ICT in Education in Context

While there is certainly some evidence supporting the potential for ICT in education, the findings to date have clearly been very mixed. What is clear from the studies above is that even where a typical project does have an impact; it is as likely to be harmful as positive. This highlights the importance of using the high-level evidence that is available to design new projects, and the need for organisations to conduct their own impact assessments within a reasonable timeframe. Nonetheless, this mixed performance in improving educational outcomes is far from being the preserve of ICT projects. For example, RCTs conducted on interventions that increased expenditure on textbooks, flip charts, or additional teachers found no impact on test scores.[14] Indeed, 'the body of evidence shows

13 Barrera-Osorio and Linden, *The Use and Misuse of Computers in Education: Evidence from a Randomized Controlled Trial of a Language Arts Program (2009)*, pp 4 & 5.
14 Banjeree, Cole, Duflo and Linden, *Remedying Education: Evidence from Two Randomised Experiments in India,* p1.

that the existence of scalable and sustainable effects from educational changes, innovations, and reforms- technological or otherwise- although frequently assumed remain an unrealised goal within education'.[15] Weston and Bain suggest that the lack of strong evidence supporting ICT in education is symptomatic of the paltry success of educational reform efforts more generally.

However, ICT in education is exceptional insofar as it is far more costly than many other educational initiatives. Thus, even if an ICT in education project is found to have made a positive impact on educational outcomes, the critical variable is its cost effectiveness relative to an alternative intervention. Or, as phrased by Angrist and Lavy, 'The question of CAI [computer-assisted instruction] is of much more academic interest since CAI infrastructure is expensive and may take resources from other educational uses'.[16] Fang, He and Linden address this issue particularly well, listing the costs per tenth of a standard deviation across a variety of projects.[17] One RCT conducted in Andhra Pradesh found that by giving teachers performance bonuses of just 3% of annual income, a project achieved improvements of 0.28 and 0.16 standard deviations in maths and language tests respectively.[18] Given that this may equate to as little as €15 per teacher per year, it seems an extraordinarily cost-effective intervention. The Banjeree et al study compared the computer-based intervention to an alternative programme which hired young women to teach remedial classes in basic literacy and numeracy skills. The remedial programme was found to be between five and seven times more cost-effective than the computer-assisted learning programme 'which brings about a similar increase in test scores at a much higher cost'.[19]

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15 Weston and Bain, *The End of Techno-Critique: The Naked Truth about 1:1 Laptop Initiatives and Educational Change (2010),* p 9.
16 Angrist and Lavy, *New Evidence on Classroom Computers and Pupil Learning,* p 2.
17 He, Linden and MacLeod, *How to Teach English in India: Testing the Relative Productivity of Instruction Methods within the Pratham English Language Education Program (2008),* pp 46- 48.
18 Muralidharan and Sundararaman, *Teacher Performance Pay: Experimental Evidence from India (2009).*
19 Banjeree et al, *Remedying Education: Evidence from Two Randomised Experiments in India,* p 20.

Conclusion

The primary challenges facing ICT in education are its record of mixed impact and its relatively high costs. The evidence from the RCTs conducted hitherto suggest that even with the benefit of quality training in a well-structured programme, teachers are likely to use computers to teach technology rather than incorporate them into the curriculum if given the opportunity. The Pratham intervention assessed by Banjeree et al produced the most significant educational benefit documented to date, and is clearly worthy of replication in another context. However, there is also undoubtedly a responsibility for any ICT in education project to assess its impact, and compare its costs relative to those incurred by alternative educational interventions.