

Guyana Education Access Project (GEAP)

Ministry of Education / Department for International Development

Development of School Capacity for IT Network Management

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For MOE, DFID and C/BT.

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ANNEX A –Revised Specifications for GEAP IT Lab	

Sister documents (Please see GEAP IT staff for copies):

1. Network Manager's Guide (October 2001)
2. Region 10 IT in Education Report (June 2001)

Terms

CA	Crown Agents
CDROM	Compact-Disc Read-Only Memory
CT	Computer Traders
CLRC	Correntyne Learning Resource Centre
CPCE	Cyril Potter College of Education
CWSS	Christianburg Wismar Secondary School
CXC	Caribbean Examinations Council
DC	Design Collaborative
GEAP	Guyana Education Access Project
GOG	Government of Guyana
GT&T	Guyana Telegraph and Telephone
INSET	In-school Education or Training for teachers
ITA	Information Technology Administrator
LFSS	Linden Foundation Secondary School
LLRC	Linden Learning Resource Centre
MHS	Mackenzie High School
MISU	Management Information Systems Unit, MOE
MOE	Ministry of Education
MS	Microsoft
NCERD	National Centre for Educational Resource Development
NIC	Network Interface Card
NMS	Network Management Software
NSSS	New Silvercity Secondary
NT	New Technology (as in Windows NT – an operating system with built in networking software)
PAR	Project Area Region
RED	Regional Education Department
SSRP	Secondary Schools Reform Project
TCP/IP	Transmission Control Protocol / Internet Protocol (A set of rules for computer communication)
Tec. Voc.	Technical Vocational
UPS	Uninterruptible Power Supply

Executive Summary

Information Technology can be used as a tool to improve teaching and learning in schools. It is certainly seen as a contributor to raising student and teacher presentation, motivation, effectiveness and efficiency.

Communications technology has opened up the world to schools, giving them access to an Internet of information covering every topic they could possibly wish to research. For Guyana, a country with a widely dispersed population and relatively fragile infrastructure, it is clear that such new technologies can bring great benefits.

However, IT is expensive. Capital costs are large and costs of consumables, maintenance, updates and replacement also have to be taken into account. In addition, IT requires “experts” to manage and maintain the specialist software and hardware. These specialists require costly training, materials and time.

This report attempts to improve understanding of some of these issues by:

1. Providing a background to the development of IT within the Guyana Education Access Project.
2. Analysing the experiences of two Guyanese secondary schools with recently installed IT laboratories.
3. Suggesting ways in which the improvement of IT delivery could be facilitated.
4. Suggesting strategies for the MOE, GEAP and other agencies to use in order to improve the long-term prospects for IT development within the education sector.

Key Recommendations

Improving the IT Lab Installation Process (§2.2 and 4.3)

- Communication links between GEAP, CA, MOE, DC, schools and computer suppliers need to be clear and simple.
- Installation should be performed by members of the GEAP IT team, or should be supervised by them.
- Telephone lines for Internet access should be considered a necessity for IT labs in schools and Resource Centres. Such applications to GT&T should be treated as a priority.

Improving Technical Support (§2.3)

- Hardware/software orders should take into account the low-level of technical capacity within schools. In particular, Network Management Software should be considered a necessity for school networks.
- Information about the GEAP IT networks needs to be shared with other projects as well as the MOE/MISU.
- The communication system between schools and technical support agencies needs to be clear and simple to all.
- Technical support should include some regular, proactive maintenance – not just emergency help.
- The ongoing staff-development of the GEAP IT team should continue in order to further enhance their capacity for technical support.
- An in-depth consultancy is needed to develop possible strategies for long-term technical support for school (and other MOE) networks.

Improving the Delivery of IT (§3.2 and 4.5)

- Systems for the sharing of teaching/learning strategies in IT need to be developed.
- Additional consultancy input is needed to support the improvement of teaching methodology, curriculum delivery and web site development.

Improving IT Teacher Training (§3.3 and 4.2)

- GEAP should continue and complete the ongoing liaison with CPCE to develop individual learning IT packs for CPCE centres and school INSET activities.
- Clear systems need to be put in place to enable Resource Centres to access GEAP funding for IT teacher-training.
- The CPCE IT Option course needs direct support with teaching in Regions 6 and 10, course development and/or network management software.
- More time is needed to develop the IT teacher-retraining course, manage the complicated schedule and investigate possible accreditation.

Improving Resource Centres (§4.3 and 4.5)

- IT Administrators for Resource Centres need to be identified and supported with appropriate training.
- Regional Education Offices, together with GEAP if appropriate, need to develop clear plans for IT and Resource Centre development in order to maximise limited budgets.
- Appropriate training and support is needed for staff at CPCE and NCERD in order to further develop Internet resources for teachers.

1 This Consultancy

1.1 Background

Under Outputs 1, 4 and 5 of the Guyana Education Access Project Information Technology (IT) infrastructure has been installed and IT training courses for teachers have been conducted during the period March 2000 to July 2001. The largest infrastructure installation has been the two school networks at Christianburg Wismar Secondary School (CWSS) in Region 10 and Tagore Memorial Secondary School (TMSS) in Region 6. In addition two smaller networks have been provided in Linden, Region 10 and Rose Hall, Region 6. These are for use by Cyril Potter College of Education (CPCE) and the local Learning Resource Centres.

The training has been at two levels in both regions – “basic” and “intermediate”. Basic IT training has been provided for all teachers from CWSS, TMSS and for those teachers attending Region 10 CPCE and GEAP Primary-Top training courses. Intermediate training has been provided to two or three teachers from every secondary school in order to enable them to start the progression on to become the IT Administrator (ITA) for their school – a teacher that can teach IT, support other teachers and maintain the equipment.

IT Teaching of school students started in CWSS and TMSS in September 2000. In addition to the more formal training courses as outlined above GEAP IT staff have also provided general support for the new IT teachers of these schools. This has included technical support, resource development, curriculum management and the introduction of Internet linkages between Guyanese schools and others in the USA, UK and Spain.

Ministry of Education capacity for IT has been supported at various levels. GEAP has been writing teacher-training modules for CPCE, supported the organisation of IT-Education conferences at the National and Regional levels and worked with schools to trial alternative learning pathways for IT for the 14-17 age range.

1.2 Current Issues

IT capacity within GEAP would seem to be the largest issue at the present time. Two VSO IT professionals have left the project, leaving two, less experienced, local people. Hence the IT capacity has been more than halved at a time when the number of school networks is due to double or even treble. This obviously decreases the level of support that GEAP can provide to all IT-related areas and impacts directly on the other IT issues.

Network management and maintenance has been poor over the last academic year in both schools, due mainly to the non-delivery of appropriate network management software in March 2000. This has made technical support difficult and specialist network training of school IT staff impossible. Replacement software has now been ordered, but requires specialist installation, following some amount of software repair to the networks.

Teacher-training of the IT teachers of tomorrow has begun to move from the “intermediate” level to a more “advanced level”. This group of teachers have learnt a great deal in one year. However, they do not yet have the skills and knowledge required to enable them to become the IT specialist within their respective schools. More advanced teacher-education activities are required – network management for example. However, such activities may require resource persons with IT knowledge outside that of the current GEAP IT team.

1.3 Objectives and Outcomes

This consultancy entitled "Development of (A) network management capacity within two schools in the GEAP Project Areas and (B) improved capacity amongst Regional and School Staff in IT delivery and resources" was conducted in order to fulfil the following objectives and provide the for the following outcomes:

Objective	Outcome	Section
Assist the current team to install Ranger 4 and reconfigure CWSS and TMSS computer labs to full working order.	CWSS and TMSS labs will be in full working order with Ranger installed.	2
Undertake network management training for GEAP IT Team and staff from CWSS, TMSS.	GEAP IT Team will have enhanced proficiency in network management and in the use of Ranger 4. Selected teachers in both Regions will have a basic level of proficiency in the use of Ranger 4 and in general network management.	3
Prepare IT order for IT labs at SLPSS, MHS, SHS as appropriate (with GEAP IT Team).	Draft specifications for new labs will be developed.	2, ANNEX A
Carry out an appropriate website maintenance programme.	Web maintenance capacity of GEAP IT staff will be enhanced.	
Assist in the planning of an IT conference in Region 6.	Region 6 IT conference programme will be drawn up.	4
Assist in the planning of the IT development of the Correntyne LRC and Linden CPCE/LRC IT labs.	CLRC and LLRC/CPCE labs will be operational.	4

1.4 Programme of Activities

Day	Activity	Personnel
1	Development of CLRC computer lab	Consultant, GEAP IT Team and CLRC Staff
2	Rebuilding and installation of Network Management Software at TMSS Lab	Consultant, GEAP IT Team and TMSS Staff
3		
4	Network Management Training with IT Team and teachers as required	Training delivered by Consultant to GEAP IT Team and Region 6 IT Teachers
5		
6	Travel to Georgetown and report writing	Consultant
7	- Revision of GEAP IT Lab specifications. - Website maintenance.	Consultant and GEAP IT Team
8	Meeting with DFID Field Manager. Meeting with MISU staff. Travel to Linden.	Consultant and GEAP IT Training Coordinator
9	Rebuilding and installation of Network Management Software at CWSS Lab	Consultant, GEAP IT Team and CWSS staff.
10		
11	Visit of MISU staff to see Installation procedure and operation of NMS.	
11	Network Management Training with Region10 teachers as required	GEAP IT Training Coordinator
	Development of CPCE Lab	Consultant and GEAP Technical Support Officer
12	Network Management Training with Region 10 teachers as required	GEAP IT Training Coordinator

	Development of CPCE Lab Visit of CPCE Turkeyen staff to see Installation procedure and operation of NMS.	Consultant and CPCE staff
13	• Debrief. • Planning and Region 6 IT conference development.	Consultant and GEAP IT Training Coordinator
14	Development of CPCE Region 10 Lab	Consultant and CPCE staff

2 Network Management

2.1 Background

2.1.1 The GEAP IT Lab

Each lab is an air-conditioned room with 14 computer workstations, each with two seats, giving a total class capacity of 28.

All workstations are networked so as to enable the sharing of resources. One computer (the fileserver) stores users' work and other information.

Each lab is designed for future expansion with 20 user software licenses and 24 port networking components – thus allowing up to 20 workstations and 4 network printers.

Workstation

- Intel Celeron processor, 64Mb RAM, 6Gb Hard Disc Drive.
- Microsoft Windows 98.
- Microsoft Office 2000 Professional (includes a word processor, spreadsheet, desktop-publisher and database).

Fileserver

- Intel Pentium III processor, 128Mb RAM, 9Gb Hard Disc Drive.
- Microsoft Windows NT 4.0.
- Network Management Software (simplifies management of the network security settings and modification of user accounts).

Shared Network Resources

All network users have access to:

- 1 HP B/W laser printer.
- 1 HP Colour Inkjet printer.
- 1 HP flatbed scanner.
- Computer Aided Learning (CAL) packages, including an encyclopaedia, Typing Tutor and MS Office Self-Learning Tutorial.
- Intranet – a small number of education web sites stored on the information server.

Internet

Internet access is controlled by school IT supervisors with an additional username and password.

All network users can browse the World Wide Web and download files using the same 'phone line at the same time. Individual user history files and cookies are kept so that usage can be monitored if needed. Email facilities are available via the World Wide Web.

2.1.2 Why Network?

Networking computers allows the sharing of resources by all users. At a simple level this includes the sharing of printers, scanners and other peripherals that may be needed by all users. This sharing obviously leads to a reduction of costs, even when the additional networking components of network interface cards (NIC), hubs and cabling are taken into account. This fact is illustrated simply in the table below.

Number of Computers	1	2	3	4	5
Cost of providing one printer for each computer (i.e. no networking).	300	600	900	1200	1500
Cost of providing networking components and one printer.	620	640	660	680	700
<i>All prices are in US\$.</i> <i>Assumptions: Cost of Printer: \$300, Network Hub: \$300, Cabling & NIC: \$20</i>					

However, resource sharing across a network is not restricted to hardware - computer programs and data can also be shared. In the GEAP school situation this has the following benefits:

- Once one computer has dialled-in to the Internet, an Internet Proxy Server application allows all workstations access to the World-Wide-Web.
- The school Intranet gives access to a few useful web sites, even when the network is not connected to the Internet.
- Small CAL programs can be run from one machine if needed, allowing easier installation of software across the network.
- Teachers can store learning materials centrally for students to access.
- IT Teachers can store relevant clipart for all students and teachers to make use of.
- Office staff can share templates for letters.
- Students can store documents in a temporary store so that others can access them.
- IT Teachers can access students' folders to find documents, mark work or add learning exercises.

In the GEAP IT Lab users' documents are centrally stored on one computer – the fileserver. This is essential for a school situation where a large number of users have to use a small number of computers. The alternative, where user data is stored locally, does not allow users to migrate from machine to machine and still access their work.

2.1.3 Why use Network Management Software?

School Networks

Networks in schools are quite different to networks in businesses. The “average” business network has 15 computers and 15 to 20 users, each of them a “responsible adult”. Larger businesses normally have money to employ a specialist network engineer and give them time and resources to maintain the network as required.

The GEAP schools also have 15 computers, but they have approximately 900 users, with a 20% yearly turnaround. The vast majority of the users are children with curiosity enough to alter computer settings and view documents of others. IT teachers are being employed, but they are not network specialists and do not have additional time, money or resources for network maintenance.

Purposes

Network Management Software (NMS) designed for schools supports the school ITA. It primarily does this by adding specific tools and utilities to the network operating system in order to simplify complicated tasks and speed up time-consuming ones. For example the addition of a single user account normally involves the following tasks:

1. Creation of a username and a password.
2. Setting user account properties.
3. Creating folders for the user's documents, favourites etc.
4. Setting security properties for the user's folders so that only s/he can access them.

NMS automates all of the tasks so that a new Form 1 of students can be added in approximately two minutes. All the ITA has to do is provide a spreadsheet of the students' names.

Other utilities are included to monitor and control usage and to set quotas for disk storage.

Network Security

Network security does not only refer to access to users' files and folders. Security of workstation settings is also vital if the network is to continue to work well. NMS allows the ITA to stop users altering settings on individual computers, thus reducing the maintenance workload. Different access can be given to different network groups so that, for example, teachers can install and control printers, but students cannot.

2.2 Installation – March 2000

The first two GEAP IT Labs were installed in CWSS and TMSS by a Georgetown firm, "Computer Traders", during February/March 2000. Previous to this was a three-month period of refurbishment overseen by Design Collaborative of Barbados.

The preparation of the tender documents involved specialist input from GEAP, MOE and Design Collaborative followed by technical revision and publication by Crown Agents.

2.2.1 Issues

(A review of the ordering and installation process was written in April 2000. This has been revised for this section.)

There was some lack of coordination with respect to communication between GEAP, CA and CT. This led to several errors with the order and the installation including:

- Windows 98 was specified as the operating system for all 28 workstations. (The original order stated Windows NT Workstation, to comply with MOE suggestions.)
- Only 26 copies of MS Office 2000 and Norton Antivirus software were ordered. (28 were needed, as the original order stated.)
- Speakers were ordered for all workstations. (The original order specified headphones.)
- Little and incomplete information came to GEAP from CT regarding dates for installation.
- Five days training for each lab was ordered. (No training was specified in the original order.)

The hardware/software supplied by CT is of good quality and the network cabling has been supplied and wired correctly. However, omissions were made with respect to software installation, particularly of network components. One could argue that more specification was needed from GEAP and/or CA regarding network installation – protocol, security settings etc. However, some omissions were not at this level, and are better classified as mistakes. These mistakes led to printers, scanners and even workstations not performing correctly and included:

- One networking protocol was not decided upon or used. Instead a mixture of protocols was installed on the computers, often in different configurations on different machines. The network functioned, but not efficiently. Network components were not installed in a coherent or consistent fashion across all machines. On one machine in each lab networking components were not installed at all.

- TCP/IP would be the obvious choice as a protocol to use. Indeed, an attempt was made to install TCP/IP as a networking protocol. However, this was not done correctly at the server or on the workstations.
- Because TCP/IP was not installed correctly, various items of software and hardware, in particular the scanner, could not operate properly across the network.
- Both printers were incorrectly installed, thus stopping the management of print jobs by network administrators.
- The UPSs were connected correctly. However, the UPS software was not configured fully. One computer would not communicate with its UPS at all.
- Many network management and network diagnostic agents are available with Windows NT, Windows 98 and/or COMPAQ Insight Manager but were not installed, or only partially installed.
- A system policy for network security was not created.

GEAP staff later rectified all of these mistakes. However some problems could not be solved - in particular the lack of some items of hardware and software that had not been supplied at the time of installation. A summary of the missing items and eventual delivery dates is given below:

Description	Qty Missing	Date of Delivery
Network Management Software (20 user license) for Windows NT Server and Windows 98 Workstations	2	Never Delivered
Flatbed Scanner	1	Apr 2000
Soundblaster Compatible Soundcard for NT Server	2	Never Delivered
40 W Speakers	2	Nov 2000
Security Hasps	30	Never Delivered
Norton Anti-Virus Software	26	Nov 2000
Headphone-Microphone Set	28	Jan 2001
Lockable Wall Cabinet (for Hub and Patch Panel)	2	Never Delivered
Ethernet Print Server	1	Nov 2000
Ethernet print Server Installation CDROM	2	1 in Nov 2000
3com Network Card Installation CDROM	2	1 in Nov 2000
Cyan Printer Cartridge for HP2000CN	3	Never Delivered
Large Black Printer Cartridge for HP2000CN	13	Never Delivered
External 56k Modem	2	Nov 2000 & Jan 2001

The contract with CT was terminated in early 2001, and GEAP/CA took the decision to source the Network Management Software directly and to not supply the other non-delivered items. The network management software was ordered in August 2001 and was delivered to Guyana in September.

2.2.2 Recommendations

1. Communication links between MOE, school, GEAP, CA and the computer supplier need to be clarified and simplified.
2. More effective checking of tender documents and orders needs to take place.
3. More effective monitoring of installation by IT specialists is needed.
4. If possible, checks need to be undertaken with respect to any potential computer supplier's reputation.
5. Training by the computer suppliers is not required. GEAP IT staff are better qualified and experienced at this type of work.

6. The inclusion of Network Installation in the order needs to be questioned. Experience shows that GEAP IT staff can complete this to a higher level, perhaps only needing support for network wiring.

2.3 *Eighteen Months On – September 2001*

2.3.1 CWSS

Following installation in March 2000, GEAP provided much intensive support to the school in order to bring the network up to a workable condition (§ 2.1.4). Much use of the lab was also made by GEAP for training of school staff and teachers from others schools.

In September 2000 a specialist IT teacher was appointed. Following some restructuring of responsibilities, and one member of the IT staff leaving, this new teacher was given responsibility for the IT lab. GEAP support continued for this new ITA, but reduced considerably over the year – leaving technical issues more and more often to the school's specialist. The school increased its use of the lab, giving access to all students in Forms 3, 4 and 5, and all teachers.

In July 2000, GEAP Region 10 IT staff finished their contracts. There was no local replacement made by GEAP or MOE. Technical support was provided by GEAP via the telephone from Region 6, with follow-up visits if requested.

By September 2001 the lab had ceased to work properly as a network. Problems included:

- Individual workstations could be used, but could not print or scan. (Printing was facilitated by saving the document to floppy disk, transferring it to the server and printing it from there.)
- Documents were not automatically stored centrally so users had to sit at the same computer if they wanted to continue previous work.
- Local storage of documents allowed all users access to all other users' data.
- Installation of additional software on two workstations had caused problems, slowing one down to almost a standstill.
- The failure of one CDROM drive had forced the IT teachers to swap drives around in order to install software. This had led to some damage being done to internal connections.
- The use of the Internet phone line for personal calls had forced the headteacher to withhold payment for the line, thus stopping its use and the use of the Internet.

2.3.2 TMSS

At the time of installation in March 2000, both GEAP and the school had no local IT specialists. This resulted in the temporary closure of the lab until May 2000, when GEAP employed two IT teacher-trainers.

Use of the TMSS lab during the period June to December 2000 was at a relatively low level, mainly due to the lack of trained IT teachers at the school. Following some training and with support (both provided by GEAP) some IT teaching started before Christmas and began to increase in 2001.

GEAP support continued at a high level throughout this time. However, the lack of any NMS, together with the very low technical capacity of the school did not allow the network to be managed correctly.

By September 2001, many minor software problems caused the Region 6 GEAP IT staff to advise that the lab be closed for maintenance.

2.3.3 Consultancy Activities (Technical)

At both schools technical activities included:

1. Backup of users' data.
2. Review of issues at all workstations and identification of hardware faults.
3. Software rebuild of some workstations (formatting hard drives and reinstalling operating system, system software and productivity suite.)
4. Installation of additional CAL software.
5. Review of server installation and condition (resulting in a complete software rebuild at CWSS).
6. Installation and configuration of Intranet.
7. Discussion with school ITA and headteacher regarding use of network and security issues.
8. Configuration of Internet proxy server and workstation settings.
9. Installation of NMS on server and workstations.
10. Configuration of security settings for groups and users.
11. Addition of user accounts for Forms 3, 4, 5 and staff.
12. Restoring users' data.
13. Testing network and NMS installation.
14. Full backup of installation.

Issues Arising.

Following the installation of the network management software at CWSS and TMSS, some "loose ends" still need to be tied up. At TMSS:

1. Four hardware faults (3 hard drives and 1 CDROM) were found on the workstations that are covered by warranty. These should be attended to as soon as possible.
2. The battery for the CMOS in the server needs replacing.
3. The software key code for Ranger 4 needs to be entered before the 30-day trial period expires.
4. The group priority needs to be checked so that "Domain Guests" have priority over "Domain Users". (This follows a similar change that had to be made at CWSS.)
5. A serial cable is needed for the external modem.

At CWSS:

1. One hardware fault (1 CDROM drive) was found on the workstations that are covered by the warranty. This should be attended to as soon as possible.
2. The password for the "admin" account needs to be changed by the school ITA.
3. A serial cable is needed for the external modem.
4. The possibility of restricting the Internet phone line to one or two Internet dial-up numbers needs to be investigated.

2.3.4 Issues

There have obviously been many problems at the GEAP IT labs over the first eighteen months. The reasons for these problems are not easily identified but would seem to include:

1. **Technical Issues.** The lack of Network Management Software, together with the need for a great deal of specialist input following incomplete installations made ongoing management more difficult.
2. **Technical Capacity in Schools.** The lack of experienced IT teachers to act as network managers and/or technicians obviously impacted negatively. This lack of experience by some has caused additional problems when errors have not been dealt with correctly, or not dealt with at all.

3. **Regular Maintenance.** With little or no regular maintenance by school ITAs or by GEAP small bugs have gone uncorrected. The lack of clear procedures and systems for school ITA to contact GEAP (or other) technical support has worsened the situation, allowing these bugs to develop into severe problems.
4. **GEAP IT Capacity.** The GEAP IT team has recently halved in number, leaving the two less experienced local staff the responsibility to support the labs. There are plans for more labs, but no more IT staff.

2.3.5 Towards Sustainability

One could argue that an increase in GEAP IT staffing is needed in order to deal with forthcoming technical difficulties. However, this is not necessary and may well be inadvisable for the following reasons:

- The use of Network Management Software (now installed) reduces the need for specialist technical support, particularly at a lower level.
- The technical capacity of the school ITAs at CWSS and TMSS is now at a level to deal with many minor issues, particularly if they make good use of the GEAP Network Manager's Guide (recently published and distributed).
- Recent staff-development initiatives have started to increase the technical capacity of the remaining GEAP IT team.
- GEAP has entered the second half of its lifespan and so needs to reduce "hands-on" activities in favour of MOE-led, sustainable programmes. The continuation of support by the GEAP IT Team may reduce the need for schools and/or the MOE to develop their own systems.

Ideally technical support from the GEAP IT Team should reduce over the next year or so as the MOE introduce new procedures and personnel as a replacement. Over time, the GEAP IT team would be able to work alongside the MOE staff, supporting them and sharing information with them about the GEAP IT Labs. By the end of 2003, as GEAP finishes, the MOE capacity would be at such a level to continue providing technical support without GEAP input.

Obviously the path towards this ideal is difficult, particularly for the MOE. The introduction of a technical support system will be complex, time-consuming and expensive. However, if such a system is not introduced, the experiences of the last eighteen months suggest that the computer labs will stop working in 2004.

2.3.6 Recommendations

Technical Issues.

1. The original IT lab specification needs revision and, as with the original specification, review by GEAP, MOE, schools, DC and CA (§ANNEX A). In particular revisions need to be made in the following areas:
 - a. All hardware/software need updating to take account of recent technical improvements.
 - b. Network Management Software should be considered a necessity in order to reduce the need for technical support. (GEAP has already ordered additional NMS licenses for four of the forthcoming IT lab installations.)
 - c. Printer specifications need updating and should specify 1 laser and 1 inkjet.
 - d. 4 DAT tapes are needed for backup purposes.
2. The quality of future installations needs to be improved (§2.2)
3. Experience of networking and NMS needs to be shared more fully with MOE departments and other projects – perhaps during forthcoming IT conferences (§4.4)

Technical Capacity In Schools

1. Technical support needs to be less intensive, but at a technically higher level.
2. Training of ITAs responsible for IT labs needs to be more hands-on, less formal and more supportive. It should be acknowledged by all that the eventual aim is for the GEAP IT staff to be redundant. (Also §4.2)

Regular Maintenance

1. Communication lines between GEAP IT staff and schools need to be made clear to all. (This has been partly addressed with the new Network Manager's Guide.)
2. Technical support needs to be more proactive and less reactive. For example:
 - a. Schedule weekly or fortnightly visits to schools to work with the school ITA and perform regular maintenance and backups.
 - b. Encourage schools to use a "problem book" for users to log errors.

GEAP IT Capacity

1. The ongoing development of GEAP IT technical capacity should be continued.
2. Consideration should be given to extending the contracts of the GEAP IT staff in order to continue support after May 2002.

Towards Sustainability

1. An in-depth study of possible technical support systems is needed in order to support the MOE. This study should include:
 - a. Current and planned IT provision.
 - b. The role of MISU.
 - c. The role of private-public partnerships.
 - d. Possible communication systems, including the use of remote access for computer administration.
 - e. Cost and sustainability.

3 IT Delivery

3.1 Background

Both IT labs have been used for four main purposes:

1. Teaching of IT to students – delivered by schoolteachers with support from the GEAP IT Team.
2. Providing basic IT training to school staff – delivered by the GEAP IT Team until recently.
3. As a resource to facilitate IT training for other groups.
4. As a resource for network management training for the school IT teachers, normally undertaken informally as part of the technical support provided by GEAP (§2.2, 2.3, 4.2).

3.2 Teaching IT in Schools

Both CWSS and TMSS are to be applauded in that IT teaching and learning has started at both institutions so quickly after the installation of specialist equipment. However, this remains at a basic level and teachers have little support to improve the style of teaching or learning.

3.2.1 Issues

- Student learning at a basic level.
- No provision of vocational need.
- No provision for using IT as a tool to support other subject areas.
- IT courses lack objectives and accreditation.
- IT teachers do not have opportunities to discuss and share good practise.
- No support for students with special needs.
- Lack of capacity of GEAP IT staff.

3.2.2 Recommendations

1. The ongoing Alternative Learning Pathways and Pre-Vocational development work by GEAP and the MOE needs to include IT.
2. IT subject-coordination meetings, similar to those held for other subjects, need to be supported in order to support of sharing of teachers' ideas.
3. Ideas and good practice from the two schools need to be fed into the NCERD revisions of the IT Curriculum documents.
4. An additional short-term consultancy is needed regarding additional uses of IT in schools to:
 - a. Support cross-curricular teaching and learning.
 - b. Support Post-14 academic studies, particularly courses that involve School Based Assessment.
 - c. Support special needs or "remedial" students.
 - d. Support Post-14 and Post-16 pre-vocational studies.
 - e. Integrate new communication technologies into teaching and learning, including the use of the Internet for collaborative learning with other schools in other countries.
5. Staff development is needed in order to increase the experience of the GEAP IT staff with respect to different IT teaching methodologies.

3.3 *Basic IT Teacher-Training*

Most of the basic IT Training for teachers at CWSS and TMSS has been facilitated by GEAP IT staff in both regions. However, more recently the ITAs at both schools have started to deliver formal and informal INSET sessions.

3.3.1 Recommendations

1. GEAP to continue working with CPCE in order to finish writing CPCE IT DE basic course. (Also §4.2)
2. GEAP to support the use of these DE materials as INSET activities for GEAP schools that have IT labs installed. (Also §4.2)

3.4 *Use of the IT Resource by others*

With the permission of the schools, GEAP has made some use of the two IT labs to train others, including teachers from other schools and local researchers.

However, schools have not started similar courses for other adults. As discussed at the Region 10 IT in Education conference (June 2001) such courses could raise revenue for the schools as well as helping form valuable links between school and community.

3.4.1 Recommendations

1. Schools and Regional Education Offices to investigate further the use of IT Labs to generate income.

4 Building MOE IT Capacity

4.1 Background

GEAP is a five-year project already past the halfway point of its lifetime. Therefore sustainability of project activities is obviously a key issue. For the IT elements of GEAP, the issue is even more acute as sustainability is harder to attain and any failures with respect to IT will attract much publicity, due to its high profile.

Sustainability requires the capacity of the MOE to be high enough to manage the remaining project activities once the project finishes. If the capacity is too low, or the activities too numerous or specialist then there will be a “sustainability deficit”.

The MOE IT capacity, both in terms of specialist knowledge and budget, remains low. In contrast, the GEAP input into IT has been large for many reasons:

- The development of IT within Guyana is seen as a priority area for the government and externally funded projects.
- The development of IT within the education system of Guyana is at a low-level when compared with other curricular areas. Therefore it has required a larger input from GEAP – an input that is then difficult for the MOE to sustain.
- IT is dependent on expensive resources – even a relatively small amount of computer equipment has a relatively large cost.
- IT is also dependent on specialist, “expert” knowledge – knowledge that requires time to learn, is costly to afford and that Guyana has precious little of.

It seems likely that a “sustainability deficit” will be hard to avoid. Indeed, it is already becoming evident when one hears of the experiences at CWSS and TMSS (§2.3). In other areas, such a deficit might go unnoticed. This, unfortunately is unlikely to happen with IT for the following reasons:

- Unlike most other subjects, IT cannot be taught without its resources. Any problems with computers can therefore be classed as severe, as they cause a complete breakdown of teaching and learning.
- IT seems to be seen as the “magic bullet” to solve all (education) problems. A great deal of effort and time is being put into the development of IT, leading to high expectations from all. Any problems are unlikely to be forgotten.

In order to minimise this “sustainability deficit” GEAP and MOE must increase their efforts to work together to build IT capacity at all levels and in all areas. Though GEAP’s original project description and masterplan only made provision for IT infrastructure and teacher-training, it is clear that a responsibility exists to work with the MOE to help solve issues of technical support, management and even finance.

4.2 Teacher Training

4.2.1 Basic IT Teacher-Training

Previously basic IT Training for teachers and Regional Education Officers was facilitated by GEAP IT staff in both regions. More recently local IT staff (often “graduates” of GEAP training), based at the CPCE and Resource Centres, have started to continue this work.

Issues

- Basic training not happening in both regions.

- Regional MOE staff do not have access to GEAP funding and resources, needed to “kick-start” training programmes.

Recommendations

1. GEAP to continue working with CPCE in order to finish writing CPCE IT DE basic course by October 2001. (Also §3.3)
2. GEAP to support the use of these DE materials at CPCE centres in Linden and Rose Hall during the academic year 2001/2. (Also §3.3)
3. Clear and well-communicated systems need to be in place if GEAP is to support any future IT training activities at resource centres.

4.2.2 IT Teacher-Training

GEAP has been recently revised its IT teacher retraining course in order to cope with recent staffing changes and to provide for the more advanced training needs. Specialists in Georgetown, as well as GEAP staff are delivering this course for approximately two days each month.

The other source of trained IT teachers is CPCE. Graduates from this programme at Linden are now training other teachers at a basic level. However, at the moment only the pre-service centre at Turkeyen runs an IT Option course because of a lack of trained staff.

Issues

- Lack of staff to teach IT Option courses in the regions.
- Network management skills not included as part of the IT Option course.
- Lack of capacity of GEAP IT staff.

Recommendations

1. Clear objectives and a well-managed schedule are needed for the GEAP IT teacher-retraining course.
2. Possible accreditation of the GEAP IT teacher-retraining course needs investigation.
3. GEAP IT staff should attend some specialist IT teacher training sessions in order to increase their skills and knowledge in certain areas.
4. IT Teacher training (IT Option) needs to be supported at CPCE centres, perhaps with teaching input by GEAP staff.
5. The revision of the CPCE IT Option course needs to be supported by GEAP. In particular, support in the procurement of NMS for CPCE Turkeyen and/or Linden would ensure that relevant network management training is provided for all new IT teachers.

4.2.3 Consultancy Activities (Training)

At both schools, some IT teacher-training was delivered as part of the consultancy. This training was at two levels:

1. Informal training for the school ITA in installation, management and maintenance of networks and network management software.
2. More formal training for local IT teachers in use of a network, including some network theory and tips for troubleshooting.

The school ITAs from both CWSS and TMSS worked alongside the GEAP IT Team during the technical work at both schools giving them the chance to see the installation and configuration process twice. Thus they each received approximately four days of quite intensive and high level training.

IT teachers from each region were invited to attend a 2-day training course, in order to better prepare them to teach using the network. The course content and participants review is summarised below:

Session	Content	Participants' Review
Day One 8.30-10.00	Introduction Network Theory Reasons for networking. Hardware Needs. Software Needs. Protocols.	Average rating: 100%
Day One 10.30-12.00	Hardware Theory and Practice When to open a system unit. Inside the system unit. Network cards and hard drives.	Average rating: 100%
Day One 13.00-15.00	Software Theory and Practice Start Menus, Desktops and Documents. (Re) Installing printer drivers. CDROM Software. Other software.	Average rating: 100%
Day Two 8.30-10.00	Troubleshooting Printers Loading paper and ink. Controlling the printer queue. Clearing paper jams.	Average rating: 96%
Day Two 10.30-12.00	Troubleshooting Network Connections Usernames, passwords and domain names. Checking network connectivity. Dealing with crashes.	Average rating: 100%
Day Two 13.00-15.00	Ranger Client Using Ranger Client to monitor and log student usage. Sending messages. Starting and closing applications.	Average rating: 90%

4.3 Resource Centre Development

GEAP is supporting the development of regional resource centres to support teachers with the preparation and planning of teaching/learning materials. Each resource centre will have a small library of text resources, a small IT lab, and access to other room/s for work or meeting purposes. The computers will be installed with productivity tools – word processor, spreadsheet etc. - together with some CAL software. Simple networking will allow the sharing of a printer. At least one computer in each centre will have access to the Internet, IF a phone line is installed.

In **Region 6** there has been development of three or four small resource centres at No. 63 Village, No. 48 Village, Rose Hall and possibly New Amsterdam. This distributed approach is necessitated by the linear nature of Region 6, and would seem to be the best solution in order to ensure access by local teachers.

In **Region 10** GEAP is supporting the upgrading of LLRC and CPCE facilities at their shared site at Kara Kara. It is planned that there will eventually be four large, well-equipped rooms – the LLRC office, the LLRC resource room, the CPCE/LLRC IT Lab and the CPCE library. These rooms will be available to teachers, education officers and trainee-teachers throughout the day and, in the case of the CPCE facilities, until 7.30pm in the evening.

4.3.1 CPCE Rose Hall (Region 6)

Two rooms have been refurbished – one as a library and one as a small IT Lab. Security grilling and air-conditioning have been fitted. Four computers have been installed, together with two printers and a flatbed scanner. These are being used regularly by CPCE and occasionally by GEAP for teacher-training activities. A person with a good level of IT knowledge has been given responsibility for the resource and GEAP is supporting her as requested.

Issues

- Internet Access
- Poorly operating UPS systems due to low-voltage conditions.

Recommendations

1. The application for a telephone line to the resource centre needs to be followed up.
2. The UPS systems need to be replaced with systems with built-in brownout correction.

4.3.2 No. 48 Village (Region 6)

This has been established towards the rear of No. 48 Primary School. Downstairs there is a large area designated as a Home Economics resource area and office. Upstairs there are designated areas for a library, IT room, conference room, office, kitchen and store.

It was planned that the consultancy would include some work to install two computers in the IT room. However, even though this area is well decorated, it is not yet furnished. In addition, there is no security grilling fitted to any windows. As such, the centre is not ready for this installation at the present time.

Issues

- Security grilling.
- Furniture.
- Internet Access.
- Responsible trained person.

Recommendations

1. An application for **two** telephone lines is needed– one for voice to the office and the other for data to supply Internet resources to the computers.
2. Security grilling is needed on all windows before any computers are installed.
3. Furniture to be supplied for office and library.
4. Installation of two PCs and one printer. One to be in the office, one in library. Connected by null-network cable to enable printer-sharing.
5. Plans for further IT provision and usage need to be clarified. It is suggested that the IT resources will be used for MOE/CLRC/GEAP activities as well as some community based programmes. The needs of such groups need to be identified in order to plan for future software and hardware expansion.
6. One person needs to be identified as the “IT person” and supported with appropriate training.
7. Furniture needs to be supplied as to the requirements of the plan in 5 above.
8. Equip “IT Suite”. As mentioned above, a room has been designated as an IT room. This would seem large enough for seven computers. If such numbers are to be installed, the walls will need to be extended to the ceiling in order to seal the room for air conditioning.

9. The number of computers and the open-access nature of the resource would suggest a client-server network with the use of network management software to monitor network security. Storing the server in a secure room (office?) would also be recommended.

4.3.3 No. 63 Village - Benab (Region 6)

GEAP is currently utilizing a large multi-roomed building at No. 63 village as office, storage, meeting and work place. In order to facilitate this, the space has been well equipped with security, air-conditioning and telephone lines. Over the next 18 months it is planned that the GEAP use will decrease and the space can be made available as a resource centre.

Recommendations

Consultation should be made with respect to the continued use of the Benab building. Following this more detailed plans need to be decided upon.

4.3.4 Region 10

The refurbishment of the IT Lab has already progressed quite far. The room is fitted with air-conditioning, security grilling and purpose made benches for computer equipment. Eight computers have been installed, with two printers and a flatbed scanner. However, the refurbishment is not yet finished, and this is now impacting negatively on the functioning of the room. The lack of power cabling and UPS systems mean that in one instance, three computer systems and a scanner are sharing one small UPS, designed for just one PC.

CPCE, LLRC, the Regional Education Office, GEAP and others have used the resource a great deal over the last two months. This large number of inexperienced users, together with the lack of any regular maintenance has caused a number of minor problems for trainers and trainees. For example, users have not been able to find their documents as others have accidentally deleted them, printers have stopped working, cables have been disconnected and then reconnected incorrectly and network settings have been altered.

These problems, together with the number of users and computers involved prompted the GEAP IT team to “rebuild” the network as part of this consultancy. Centrally stored, shared folders were set up on a Windows NT server, so that users’ documents were available from each and every workstation. Simple security policies were added so that users do not have access to internal workstation settings or to other user’s documents.

Issues

- Responsible trained person.
- Coordination of training.
- Internet Access.
- Power cabling.
- UPS systems.
- Furniture and Benching.
- Network management.

Recommendations

1. An application for **three** telephone lines is needed– one for voice to the LLRC office, one for data to the LLRC office and the other for data to the IT Lab.
2. Power cabling is needed for the third wall.
3. Four or five additional UPS systems are needed (perhaps making use of the ones from CPCE Rose Hall?).
4. Chairs need to be ordered and supplied.

5. The benching needs finishing, with wooden boxes being constructed below the benches in order to house the system units, UPSs and cabling.
6. Additional storage space needs to be found or constructed in order to store the additional items from the floor and benches of the IT Lab.
7. One or two person/s need to be made responsible for the IT resource and it's maintenance – the IT Administrator. This/these ITA/s should be available for most of the time the lab is being used in order to monitor usage and support trainers and trainees.
8. Coordination and planning of the use of the lab needs to be carefully timetabled and the resulting schedule needs to be published for all users. In addition, clear and simple guidelines for the use of the resource need to be written, agreed and displayed prominently. Such transparency of use and usage will reduce frustrations, misuse and possible complaints about, and from, users.
9. Because of the large number of users and the relative inexperience of any ITA, CPCE needs to consider some additional network management software. The addition of this would reduce the maintenance requirements of the network, facilitate the easy monitoring of application use, and reduce the time required for tasks like user addition and deletion.

4.4 IT/Education Conferences

IT is a very new subject in Guyana schools. As such it is important that projects such as GEAP support the MOE to increase its own body of knowledge. This has been started in the past, with GEAP's involvement in the National IT Workshop (December 2000) and the Region 10 IT in Education Conference (June 2001).

It is hoped that such emphasis on this new technology and new subject will continue, both from GEAP and the MOE. Looking at forthcoming planned events, it would seem particularly useful if IT could be key components of the GEAP Study Tour feedback workshops and the proposed MOE/GEAP USE Replication Conference in June/July 2002.

Conferences and workshops like those mentioned above only serve to kick-start discussion and generate ideas. It is clear that progression depends on the development of these ideas into sustainable policies and systems. However, it is also clear that this development is not always taking place.

4.4.1 The Region 6 IT Conference

A Region 6 IT Conference is proposed for November 2001. The aims of such an event would be:

1. To give an opportunity for delegates to raise and discuss IT related issues, with particular reference to Region 6.
2. To build on previous MOE/GEAP IT related work from the Region 10 IT Conference and the GEAP Output-to-Purpose Review.

A suggested programme is as follows:

½ hour	Welcome and Introduction (Region 6 RedO, Kim Spencer)	
1 ½ hour	GROUP A The TMSS IT Lab (Babita Sangster) • Issues. • Network Management Software. • Questions.	GROUP B Issues arising from the GEAP OPR (Paul Worral)
½ hour	BREAK	

1 ½ hour	GROUP B Issues arising from the GEAP OPR (Paul Worral)	GROUP A The TMSS IT Lab (Babita Sangster) • Issues. • Network Management Software. • Questions.
1 hour	LUNCH	
1 ½ hour	Region 6 Issues (Bashir Khan)	
½ hour	Plenary and Close	

4.5 Web Site Development

As an awareness raising exercise, GEAP developed a web site (www.geap.org.gy) in late 1999. Initially containing some just contact details and small amounts of information, this expanded over time into a resource for teachers and parents. Teachers attending GEAP IT courses spent time writing school web sites, eventually producing a site that had web pages for all schools within the GEAP project regions.

With inputs from CPCE, NCERD, LTI and other institutions and groups the GEAP web site expanded further and started to include curriculum guides, schemes of work, lesson plans, online learning resources and other information useful to teachers and educators in Guyana.

The geographical nature, sparse population and lack of access to information for many would suggest that the Internet could be extremely important in Guyana's development, not least in the education sector. Nevertheless, the development of web sites seems to be slow, probably due to the lack of expert knowledge, the relatively few Internet Service Providers and the poor telephone infrastructure.

Development of the GEAP web site has now also slowed, due mainly to the reduction of GEAP IT capacity. However, further development at this stage by the GEAP IT staff is unlikely to be sustainable. Like technical support (§2.3) the building of capacity in MOE institutions is needed in order to improve the likelihood of ongoing development post-GEAP.

4.5.1 Recommendations

1. Person/s need to be identified at the MOE, NCERD and CPCE to take responsibility for web site development.
2. Liaison needs to be facilitated between the MOE/MISU and SDNP with respect to further web site development.
3. Appropriate training needs to be provided for web developers in MOE institutions.
4. Further development of school web sites needs to be supported with additional training as needed.