

UNIT 4:

Obtaining, Optimizing and Sustaining Internet Access

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School SPTs that are thinking about establishing their first computer system and want to explore the issue of also connecting their new system to the Internet, and school SPTs that already have a computer system but have not yet connected it to the Internet, may find this unit helpful. In many countries, the government does not provide Internet access for schools, nor do schools have special subsidized rates for Internet access. If schools in these countries want to have access to the Internet, they must figure out how to get connected, and they must use their existing school budgets, or generate additional funds, to pay the initial and ongoing costs for connectivity and use. How much your school will have to pay for Internet connectivity, if it is not paid by the government, will depend on several variables, including: a) the type of connectivity you decide to use; b) the amount of connectivity you want; c) how much connectivity you consume each month; and d) what the local Internet service provider (ISP, companies or government agencies that are in the business of providing individuals, companies, and public organizations with access to the Internet) charges you for the type of Internet and quantity of access you use. Depending on a school's situation and the variables mentioned above, Internet access costs can range from US\$30 to more than US\$800 a month. For many schools, even US\$30 a month can be difficult to pay, so it is important to determine whether the educational return on an investment in Internet access is greater than the educational return on investing scarce funds in other school activities and infrastructure. The following should help you and the SPT answer this critical question.

Why should we connect our computer system to the Internet?

As with question at the start of Unit 3, this question may appear to be simple. Members of the SPT may immediately answer, “To give our students access to all the information that can be found on the Internet so they can learn more.” However, before you and your SPT jump to this conclusion, you need to discuss this and some related questions as a team. It may also be important for you and the SPT to expand the discussion so all the teachers in the school, parents and members of the community, and students have a chance to weigh in on this question so you can learn what others think.

In some communities, parents and teachers may be nervous about allowing their children and students to have access to the Internet. They may have some sense of the importance of the information on the Internet to their children’s and students’ education, but they also may worry that

bringing the Internet to the school may expose their children and students to pornography, different ideas about religion, different perspectives on relationships between men and women, different ideas about politics, different cultural and social values with which parents and teachers may not agree, and dangerous people. These are legitimate concerns, and if they are not handled carefully and discussed openly, the school leaders may create difficult relationships with parents and other members of the community by deciding on their own to connect to the Internet.

Organizing a School-Community Meeting:

To address this important matter, you and the SPT may want to consider organizing a school-community meeting where school staff, parents, and students can discuss this topic openly. A suggested agenda for this meeting is provided on the following page.

Suggested Agenda for a School-Community Meeting to Discuss Whether the School Should Connect the Computer System to the Internet



Date: _____



Time: _____



Meeting called by: _____



Proposed Participants: _____



Proposed Agenda Items:

TOPICS
<p>Opening statement by the School Director:</p> <ul style="list-style-type: none"> • Welcome teachers, parents, and students to the meeting. • Introduce the members of the SPT and explain the role of the team. • Explain the purposes of this meeting: a) the school is considering connecting its computer system to the Internet; b) how the school plans to use Internet connectivity to improve teaching and learning; c) to hear from members of the school community about their perspectives on this question; and d) to answer questions from parents, teachers, and students about the Internet and how the school will manage access.
<p>The School Director and the SPT summarize answers to the following additional questions:</p> <ul style="list-style-type: none"> • How will the school connect the computer system to the Internet? • How much will it likely cost for Internet access, and how will the school pay for it? • How will the school use Internet access to improve school management and student learning? • How can the Internet help prepare students for further education and entry into the job market? • How can the school protect students from accessing undesirable information on the Internet? • Distribute a document that summarizes the answers to these questions.
<p>Open the meeting to comments and questions from the community [A summary of this discussion would be written on large sheets of paper at the front of the meeting to keep a record of the discussion. A list of next steps would be recorded.]</p>
<p>The School Director summarizes the discussion and presents the next steps.</p>
<p>The School Director asks participants to vote on the question by a show of hands. [This could be a formal vote to decide what the school should do, or an informal vote to determine how people feel.]</p>
<p>The School Director closes the meeting by thanking everyone for coming. [If appropriate, the school may invite all participants for refreshments and socializing.]</p>



Additional Instructions:

Before this meeting is organized, the SPT needs to prepare answers to the questions listed in the agenda for this meeting. The following sections of this unit will help you prepare your answers to these questions.

What are the different ways to connect a computer system to the Internet?

There are a variety of ways that can be used to enable schools and others to establish a connection to the Internet. The table below summarizes the most common ways that schools use to connect their computer systems to the Internet and some

advantages and disadvantages of each approach. Not all of these options will likely be available where your school is located. In the next section of this unit you and the SPT will research which connectivity options are available in your area, the local requirements for each option, and what each available option will cost.

TECHNOLOGY OPTIONS	FEATURES AND REQUIREMENTS	BANDWIDTH RANGE	ADVANTAGES / DISADVANTAGES
Dial-up	Dial-up Internet access uses a normal phone line to connect a computer to an ISP. It requires a modem (which is often a standard part of your computer); a phone line; and an account with a local ISP. This is one of the simplest and oldest forms of Internet access. This is an on-demand form of access. You control when you are connected to the Internet, that is, a person or the computer must “dial” the ISP using the modem (similar to making a phone call) to connect to the Internet. When the person is done using the Internet the connection is closed (hung up).	The access speed is a maximum of 56Kbps (the slowest form of Internet access) and uses an analog signal (not digital) to send data and information to and from the ISP.	<p>Pros:</p> <ul style="list-style-type: none"> Relatively inexpensive (some governments subsidized dial-up access for schools). Wide availability where phone lines are present and often uses local or toll free numbers to dial. May use existing infrastructure (a phone line). Access can be controlled by staff or user automated settings. <p>Cons:</p> <ul style="list-style-type: none"> Occupies the school's phone line so others cannot use it while connected to the Internet. Charges for time on the phone line can increase the total access cost. Connection is not always “on.” Slow, so sharing access among many (5 or more) computers is difficult. One connection per phone line unless additional equipment or software is purchased (depending on the operating system).
ISDN (Integrated Services Digital Network)	Like dial-up, this option uses an existing phone line for access, and users need to initiate the connection to the ISP. This is an aging technology that is being replaced by DSL/ADSL (see below) in many countries. Internet access is charged according to the amount of time you are connected, usually by the minute.	The access speed ranges from 64Kbps to 128Kbps. It uses digital signals to communicate with the ISP.	<p>Pros:</p> <ul style="list-style-type: none"> Does not tie up a phone line. Voice calls can be made while connected to the Internet. Wide availability where the technology is still being offered. Usually faster than a 56Kbps dial-up. <p>Cons:</p> <ul style="list-style-type: none"> ISDN is notoriously difficult to set up and troubleshoot. This is an outdated technology. Per-minute charges are usually applied and can add up. Access speeds often are not as fast as what the ISP advertises. Connections are not always “on.” Not practical for more than 8–10 computers. Limited expandability.
DSL/ADSL (Digital Subscriber Line / Asymmetrical Digital Subscriber Line)	Unlike dial-up, DSL/ADSL provides “always-on” access using a DSL or ADSL modem and a dedicated line that the ISP installs. The ISP usually offers different speeds for sending information to and receiving information from the Internet (uploading and downloading). Since this option can offer sufficient speed to connect all of the computers in the school to the Internet, additional network equipment probably will be needed.	Access speeds range from 128Kbps to 1.54Mbps. The upload and download speeds are often different, with uploading being slower.	<p>Pros:</p> <ul style="list-style-type: none"> Affordable relative to other broadband options. Shares a telephone line, but often a new line must be installed. Wide variety of speeds and prices. There is often a choice of service providers from which to choose. <p>Cons:</p> <ul style="list-style-type: none"> Available only in limited areas. Actual speeds can vary widely and differ from what is advertised. You must be within 2 kilometers or so of the switching site; the farther away you are, the lower the speed the ISP will be able to offer you.

TECHNOLOGY OPTIONS	FEATURES AND REQUIREMENTS	BANDWIDTH RANGE	ADVANTAGES / DISADVANTAGES
Cable	Cable Internet access connects you to the Internet through a coaxial cable, often using the same line that carries your cable TV service. A special modem is needed to connect the actual cable to your computer system. Cable connections offer very high connection speeds, 1 – 2 Mbps, at low costs, however the connection is shared with other cable users and this can cause speeds to change as others use the service.	Access speeds range from 500 Kbps to 2 Mbps and higher. As with other broadband services, upload and download speeds may differ.	Pros: <ul style="list-style-type: none"> • Wide availability where TV cable services are offered. • Relatively inexpensive compared to other broadband connectivity options. Cons: <ul style="list-style-type: none"> • Sharing with neighbors poses some unique security risks and congestion problems. • Router required to share the connection with more than one computer.
WiFi/WiMax	These two forms of wireless Internet access are usually available in larger towns and cities, and ISPs use them for either point-to-point delivery of service (WiFi) or to offer comprehensive access across the entire city. WiFi access is also used to provide “last-mile” connectivity in rural areas to connect wired access (ADSL for example) to a location that is 15-30 kilometers away. Such access demands a clear line of sight between the source and the destination. WiFi point-to-point access requires a directional antenna and a wireless receiver. WiMax only requires a WiMax receiver; however, WiMax is not commonly available.	WiFi access speeds range from 11Mbps to 54 Mbps and can vary due to distance from the transmitter, materials the make up buildings, and quality of the antenna. WiMax speeds range from 1.5 to 2.0Mbps and higher.	Pros: <ul style="list-style-type: none"> • No cables needed, but for WiFi, line-of-site between the source and the school is required for the signal to be received. WiMax does not require line-of-site. • Enables “last-mile” connectivity for rural schools that are 20 Km or so from a source of connectivity. • Can be delivered via a series of wireless connection points to a rural school. • Relatively simple to install and configure. Cons: <ul style="list-style-type: none"> • WiFi requires an antenna and line-of-site link to the source. This can be difficult in congested cities. • Requires a special modem for both WiMax and WiFi. • WiMax connectivity is relatively uncommon and usually restricted to large cities.
Cellular-based: GPRS, EDGE, CDMA 2000, EVDO, G3, etc.	Cellular-based access requires a cell phone network that offers 3G (third generation) or CDMA 2000 (Code division multiples access) data and voice services in the community where the school is located. A 3G, CDMA2000 or cellular modem (which is usually a small inexpensive device) is required to connect a computer or computer network to the Internet via a cell phone provider. Access time is often paid in the same way as voice calling. Some data services charge according to the length of time you are connected to the network and the amount of data transmitted and/or received.	Access speeds range from 56Kbps to over 500Kbps. This speed depends on the type of service available, the strength of the cell signal, the distance from the nearest cell tower, and the nature of the building where the cell modem is used.	Pros: <ul style="list-style-type: none"> • Widely available where cellular phone service exists. • Simple and easy to install and use. • Fairly reliable. • Best used for occasional Internet access or for high-priority Internet uses such as urgent communication. • Connectivity hardware is inexpensive. Cons: <ul style="list-style-type: none"> • Can be expensive compared to DSL/ADSL or cable service. • Occasional slow speeds can limit its use for sharing access among more than 1-2 computers. • Some of the more specialized cellular services are not commonly available. • Occasionally, you have to sign a one- or two-year contract for voice services to get data services.
Satellite - VSAT	This options requires installation of a satellite dish (US\$800–\$3,000 depending on the type of satellite service available), which is then connected to your system. Satellite access enables rural users or those who need broadband access, but where DSL/ADSL is not available, to gain fast access to the Internet. Satellite connections can be affected by rain and dust storms.	Speeds depend on the type of service (shared or dedicated). Speeds range from 64Kbps to 5Mbps uploading and 128Kbps to 11Mbps downloading	Pros: <ul style="list-style-type: none"> • You can access the Internet anywhere you have a clear exposure to the sky where the satellites is located (not blocked by trees or buildings). • Available almost everywhere but must be within the “shadow” of transmitting satellites. Cons: <ul style="list-style-type: none"> • Upload speed is not nearly as fast as download speed. • Very little competition and therefore prices can be very high. • Heavy users of bandwidth are often affected by “fair access policy” limiting use.

Which Internet connectivity options are the best for our school?

To answer this question, you and the SPT members will need to learn which options for Internet access are available in your location, the technical specifications for each option, the levels of connectivity speeds available, and what providers will charge for the different types of service and levels of access speed.

One approach to carrying out this research is to have members of the SPT visit companies, cyber cafés, if they exist, other schools and government offices, and households to learn whether they have Internet access, and if they do: a) what types of service they use; b) which ISP they have contracted with; c) whether they are happy with the quality and reliability of the service provided; and d) the access speeds they use. If you learn that no organizations or individuals in your location have Internet access, you will need to visit the nearest large town to identify ISPs and/or telecommunication companies to find out whether they are able to provide Internet access to your school and are interested in doing so.

Below and in the Toolkit's Annex and CD is a **Connectivity Research Data Sheet** you and members of the SPT can use to record the information you collect for each type of Internet access available in your location. Once you have completed the research, one or two members of the SPT can evaluate the results and recommend the best Internet access option for your school.

Once the best option has been decided on, you and the SPT will need to determine whether the school can afford to pay for the type and level of Internet access you feel is best. You and the SPT also may need to consider a mix of income-generating activities (see Unit 7) to raise the money needed to establish Internet access and pay monthly access fees. If the school is planning on sharing Internet access among all of the school's computers, it is important to develop policies about how this access should be used and shared. For example, if one person starts to download a large file, such as a movie or music file, everyone else's access will be negatively affected.

CONNECTIVITY RESEARCH DATA SHEET				
TECHNOLOGY OPTIONS	AVAILABLE? YES/NO	SPECIFICATIONS / SPEEDS	ESTIMATED ANNUAL COST	COMMENTS
Dial-up				
ISDN (Integrated Services Digital Network)				
DSL/ADSL (Digital Subscriber Line / Asymmetrical Digital Subscriber Line)				
Cable				
WiFi/WiMax				
Cellular-based: GPRS, EDGE, CDMA 2000, EVDO, G3, etc.				
Satellite - VSAT				

Fixed line vs. 3G wireless connectivity



Securing reliable and affordable Internet connectivity, with sufficient bandwidth for the large number of simultaneous users at schools, is one of the most significant challenges facing schools, especially rural schools, around the world. For example, many schools are not connected to the national fixed line telecommunication grid and therefore wireless or satellite connectivity are their only options. Satellite connectivity has very high installation costs and with monthly connectivity expenses that can equal the salary of three or more teachers this option is out of reach for most public schools.

Fortunately, access to the Internet for many schools has recently become affordable as national cell phone networks have spread rapidly out from urban areas and the providers have expanded their services to include 3G wireless connectivity. Depending on your school's location, there maybe one or more cell provides that can provide Internet connectivity. To learn about your options, you will need to talk with your local cell phone providers to:

- find out if they offer Internet connectivity and if they do, what pricing plans are available;
- find out if they offer discounts to schools; and
- find out about the technical support they provide.

In many areas, the signal infrastructure and market demand for 3G wireless connectivity is not sufficiently developed to provide the level of reliable connectivity for full Internet access at your school or it may be expensive and priced per unit of content downloaded. However, it may be sufficient to enable access to email for staff and limited Internet use. Before signing up for wireless connectivity, ask for a month-long trial program so that you can validate the providers claims of signal strength and reliability. You will also want to compare the costs and features of the wireless solution to other options that may be available. Since technology and access to different connectivity options change rapidly, you will also want to reevaluate your Internet connectivity options at least once or twice a year.

How can we ensure appropriate and safe use of the Internet in our school?

One of the main concerns of parents and teachers about providing Internet access in schools is ensuring that students are not exposed to undesirable content. While different approaches can be used to address this concern, none of them is 100 percent successful. There are simply too many ways people—especially curious smart students—can use the Internet to gain access to information that teachers and parents may consider as inappropriate. All the school can do is to encourage students and teachers

not to use the school's computers in inappropriate ways and to take physical steps to make it difficult to access inappropriate content. To achieve this, you and the SPT can use any of four approaches that have proven successful in limiting teachers' and students' access to inappropriate content:

1. Establish policies, in a collaborative way with teachers and students, specifying how the school's computer system should and should not be used, a code of conduct for Internet use, and define strict consequences for people not following these policies.

2. Organize the physical layout of the computer lab so all screens are visible from anywhere in a room so users will be inhibited from accessing inappropriate content.
3. Use software to prevent users from accessing websites known for inappropriate content.
4. Organize discussions among teachers and students about why some Internet content is inappropriate and about the role of gender in how we use computers and the Internet.

Rules and policies alone do not change people's behavior. However, good rules and policies mandating how students and teachers should and should not use computers are a necessary condition to inhibit inappropriate behavior. These

policies and rules should have two important features. First, students and teachers should develop them collaboratively; they should not be imposed by the school director. If the staff and students do not play an authentic role in creating these policies, they probably will not follow them. Second, the consequences for not following these rules must be applied equally to every member of the school and community. No one can be above the rules. If the principal is found breaking the rules, then he or she must suffer the same punishment as a student would.

Another aspect of this approach is to have students and teachers create a school-wide code of conduct and have each person sign a personal contract, a commitment to peers, teachers, and parents that each member of the community will use the computer system appropriately.



As discussed in Unit 3, arranging the computers in the lab along the walls contributes to more effective educational use. This same arrangement can also mitigate inappropriate use of computers since what people are doing will be visible to all other users. This is a simple way to influence the behavior of students and staff.

The latest version (version 8.0) of Microsoft's Internet Explorer® (IE), the software for exploring and using the Internet that is part of the Windows® OS, can be set to restrict access to websites through a feature under the "Tools" menu option, called "Parental controls." The computer system administrator can set IE to prevent users from accessing specific websites and types of web content. Setting up IE's web-filtering feature should be done very carefully so you do not accidentally restrict valuable education information. For example, if you decide to filter any content with the word "sex," you will prevent students from researching sexually transmitted diseases or learning about HIV/AIDS.

The other two major browsers for the Windows® OS, Firefox and Google Chrome, do not yet (as of 2010) have parental controls. However, you can download a free add-on to Firefox to filter web content. When this Toolkit was written, Google Chrome did not have parental control capacity. This fact shows how difficult it is to limit

web access. Once students learn that IE and Firefox won't let them visit certain websites, some will simply download and use Chrome. To help address this problem, the school can download additional software to inhibit access to inappropriate websites. One product with this capability is "K9 Web Protection" (<http://www1.k9webprotection.com/>). Again, using software to control access to content cannot provide 100 percent protection; it can simply make it more difficult to access inappropriate content. Web-filtering software alone will not protect the school, but these three other approaches when used together can increase the odds of success.

One of the most important things you can do to influence inappropriate behavior on the Internet is to discuss the issue openly with teachers and students. It is important that this not be done from a dictatorial perspective with heavy-handed punishments and threats. By talking about the issue openly, frankly, and professionally, you can help students and teachers understand why it is important to manage this community resource responsibly and respectfully. Such discussions should take place occasionally during the year, and, over time, you will create a new culture around the use of the Internet, a culture that will incorporate internal rules of conduct to reinforce the written code of conduct for using the school's computers.

