is&t

News about information services and technology throughout MIT

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Inside! Schedules of Hands-On Computer Training Courses and Free Computer Events

Learning as You Go with Mobile Games

• **Robyn Fizz**

Let's say you're part of a group from the year 2100 that has the power to reach back in time and put five laws about climate change on the Cambridge ballot in 2008. If passed, these laws could lead to very positive outcomes in the future. Your group needs to tap insights from local experts, then discuss and nominate laws that have a decent chance of passing. Are you up to the task?

Twenty middle-school students from Gloucester took on that challenge recently, as they played a game on the MIT campus called TimeLab 2100. Four-person teams (consisting of two pairs of students) were given two HP iPAQ 5915 handheld devices with global positioning systems (GPS). Each team used the icon-dotted map on its handhelds to navigate to sites on campus where information could be gleaned.

At the outset, the teams were introduced to their virtual guides, Matt and Anne – one guide appearing on each handheld. Matt, a grad student in the Department of Earth, Atmospheric and Planetary Sciences, counseled the teams on how much impact a law would have in reducing climate change or managing its effects. Anne, a grad student in Political Science, advised the teams on how popular each law was likely to be.

Matt and Anne were not there in person, but each pair of students saw a photo of their guide and read his or her on-screen comments to the other pair as they approached different sites on campus. Most of the sites were tied to content. For example, across the river from the Hancock's weather beacon, Matt and Anne's "dialog" focused on early warning systems to help people plan for floods, storms, and high heat. At a bus stop, Matt and Anne discussed public transportation and its role in reducing carbon emissions. Standing by the moat at the MIT Chapel – used in 2100 to sustain sea life no longer native to New England – Matt and Anne gave their views on wildlife preservation.

The group then reconvened to weigh the pros and cons of 15 potential laws, keeping in mind each law's likely impact and popularity in the year 2008. Each team nominated one law and championed it in a short speech. The group voted on all the laws (three votes per team) and, to wrap up the game, the votes were tallied.

What did the students from Gloucester gain from this assignment? They learned in an engaging way about aspects of climate change – from carbon-free power and ecosystems to public health and natural disasters. They moved around in the real world with a sense of purpose. They worked in teams to sift through what they'd learned, and advocated for laws they thought would be effective. In short, they took on the role of informed and active citizens.

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Learning as You Go

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Going Mobile

Developed this spring, TimeLab 2100 is one of many science-oriented mobile games created for middle-school and high-school students by staff at MIT's Scheller Teacher Education Program (STEP). Another game STEP has in the works – in collaboration with the Columbus Zoo in Ohio – is Zoo Scene Investigator, where student teams try to solve a zoo break-in.

Both TimeLab 2100 and Zoo Scene Investigator are what's known as augmented reality (AR) games: they combine real-world explorations with information supplied by handhelds (which can include cell phones).

As teaching tools, handhelds offer many advantages over school computer labs. They

- Cost less and are easier to maintain
- Are easy to transport (e.g., 25 can be put on a cart and moved as needed)
- Connect wirelessly to networks, handhelds, and other devices
- Can be used outside or in the classroom

Augmented Learning

In his book, *Augmented Learning: Research and Design of Mobile Educational Games* (MIT Press, 2008), STEP Director Eric Klopfer notes that "much of expert thinking and complex communication relies on information technologies." He contends that mobile games like TimeLab teach 21st-century skills, such as navigating information, engaging in sustained reasoning, managing complexity, collaborating, and planning for the unexpected.

The STEP group too is learning as it goes. With each game it develops, it tries to improve the user experience and explore what works best for audiences in different settings. In TimeLab, for example, the group built a game that allows for custom localization. Games with a significant "home base" factor often have the strongest appeal for players. The trade-off is that they have significantly less appeal for players unfamiliar with that location. TimeLab tries to find a middle ground – a game generic enough to be customizable for almost any location, while still delivering on content.

TimeLab is also the first STEP game to feature dialog that players read out loud. Since feedback on this was positive, Klopfer plans to incorporate it in other games.

Got Game?

What will it take to get mobile games into the educational mainstream? According to Klopfer, there's no simple answer. Educators who are leery of video games or dissatisfied with computer labs usually aren't aware that the paradigm for mobile learning games is very different – with a focus on group activities guided by the teacher. In order for educators to embrace these games, they will have to be easy to use – both in terms of technology and how they fit in, conceptually, with coursework.

STEP has posted an Outdoor AR Toolkit at **education.mit.edu/drupal/ar**. Free for educational, non-profit purposes, this software enables teachers and ed tech designers to build their own AR simulations. An important follow-up step will be to build a community around this toolkit.

Klopfer is just as excited about what he dubs "Junior Editor," a simplified version of the AR Toolkit geared to students. "I like kids having a lot of input on authoring. It's a great way for them to learn and it partially solves the problem of localization."

To find out more about augmented learning, see the STEP site at **education.mit.edu/drupal** and Surf Sites on page 8. §

Update on the iPhone

In mid-July, Apple released the iPhone 3G, and iPhone 2.0 software for updating the previous generation of iPhones. The 3G and 2.0 software bring new features and purchasing plans, which IS&T is evaluating.

Those with older iPhones should upgrade to the free 2.0 update, available via iTunes. Important for MIT users is 3G and 2.0 support of MIT personal certificates. From the beginning, the iPhone supported MIT IMAP email; 2.0 adds support for Exchange email and calendaring, now in pilot at MIT. TechTime still cannot be synchronized with the iPhone, but your personal certificate gets access to the web version of TechTime.

The 3G supports 3G data connections; previous iPhones supported only slower EDGE connections. Signal coverage for AT&T, currently the only iPhone carrier, is still spotty in and around MIT. Consult others with AT&T devices to confirm coverage in areas that are important to you.

Accounts

AT&T offers two types of accounts for the iPhone with discounts on monthly charges. The CRU (Corporate Responsibility User) account is paid directly by MIT, and comes with a 15% discount. The IRU (Individual Responsibility User) is a personal account with a 10% discount; anyone affiliated with MIT is eligible for an IRU account.

Faculty and staff interested in the iPhone for MIT business should read MIT's policies on cell phone and mobile devices at **web.mit.edu/ist/topics/telecommunications/policy.html**. Faculty and staff with an existing iPhone personal "retail" account should convert to an IRU to take advantage of the 10% discount (**www.att.com/wirelessdiscounts**).

For details about the iPhone at MIT, see **itinfo.mit.edu/product.php?vid=780**. If you have questions concerning the iPhone, contact the Computing Help Desk at 617.253.1101 or computing-help@mit.edu. §

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Software Spotlight

Virtual Realities: IS&T Supports VMware Across Platforms

• **Deb Bowser**

On July 10, IS&T announced support for VMware Workstation for Windows and Linux, and VMware Fusion for Macintosh. VMware makes it simple to create and run multiple virtual machines on desktop or laptop computers.

Through virtualization, professors can deliver specialized software to students in a course, and individuals can run a second operating system on their computers. Virtualization software can also be used in data centers for server consolidation and effective management of IT resources.

What Is a Virtual Machine?
According to VMware's web site, a virtual machine is a tightly isolated software container that can run its own operating systems and applications as if it were a physical computer. A virtual machine contains its own software-based central processing unit (CPU), RAM hard disk, and network interface card.

An operating system can't tell the difference between a virtual machine and a physical machine, nor can applications or other computers on a network. Even the virtual machine sees itself as a "real" computer.

Advantages of VMware
VMware Workstation and Fusion let you use virtual machines to run Windows and Linux on your desktop or laptop computer. These virtual machines offer several advantages over physical hardware, including

- *Compatibility*: Virtual machines are compatible with all x86 computers. (**Note:** x86 is the standard CPU architecture for desktops, laptops, and many workstations and servers.)
- *Isolation:* Virtual machines are isolated from each other as if physically separated. As a result, the availability and security of applications in a virtual environment are superior to those in a non-virtualized system.
- *Encapsulation*: Virtual machines encapsulate a complete computing environment, which makes them highly portable and easy to manage. You can move or copy a virtual machine from one location to another just like any other software file, or save a virtual machine on standard data storage media, such as USB flash drives and CDs.

vmware®

- *Hardware Independence:* Virtual machines run independently of underlying hardware. You can move a virtual machine from one type of x86 computer to another without making any changes to the device drivers, operating system, or applications.

In real-world terms, virtualization lets you switch between operating systems with the click of a mouse, drag-and-drop files between virtual machines, and access all the peripheral devices you rely on. For system administrators who want to put software through its paces before distributing it to their departments, VMware eliminates hours of rebooting while testing applications, drivers, services, and patches.

To learn more about virtualization, see VMware's overview at **www.vmware.com/technology/virtual-machine.html**.

Obtaining and Installing
VMware is available for use by all MIT faculty, staff, and students. Download links and installation instructions are available via the VMware product pages (see chart below). These pages also include system requirements and links to known issues, user manuals, and other documentation.

As part of the Microsoft Campus Agreement at MIT, the licensing structure for using instances of a guest operating system within a virtual environment is different than that for a standalone machine. For details, see **web.mit.edu/ist/topics/software/msca.html#virtual**.

What You Can Virtualize
VMware can run a wide range of guest operating systems. Those of most interest to the MIT community include

- 32-bit and 64-bit Windows XP and Windows Vista
- 32-bit and 64-bit Red Hat Linux Enterprise 4 and 5

Note: A 64-bit guest operating system can only be installed on a 64-bit host (physical) machine.

While VMware Fusion can install Windows and Linux systems on Macintoshes running Mac OS X 10.4.9 or later (Intel machines only), VMware cannot create any guest Macintosh operating systems, due to Apple licensing restrictions.

VMware also runs on a variety of devices, including high-speed USB 2.0 devices and setups with multiple monitors.

Support
IS&T recommends that VMware users at MIT follow security and best-practice guidelines to ensure that backup, antivirus, and anti-spyware software are installed on each virtual machine. For more information, see **itinfo.mit.edu/article.php?id=8903**.

The VMware Release Team maintains a wiki at **wikis.mit.edu/confluence/display/vmware/VMware+Release+Project**.

If you have questions about installing or using VMware, contact the Computing Help Desk at 617.253.1101 or computing-help@mit.edu. §

IS&T Product Pages for VMware

VMware Workstation 6.0.x for Windows
itinfo.mit.edu/product.php?vid=790

VMware Fusion 1.x for Macintosh
itinfo.mit.edu/product.php?vid=791

VMware Workstation 6.0.x for Linux
itinfo.mit.edu/product.php?vid=792

Network Notes

iPassConnect Clients for Leopard and Vista

• Lee Ridgway

IS&T has released new clients for iPassConnect, which provides remote-connection service to MITnet and the Internet. The new versions – iPassConnect 2.39 for Macintosh and iPassConnect 3.6 for Windows – add support for Mac OS X 10.5 (Leopard) and Windows Vista, respectively.

Global Connections

iPassConnect is a fee-based, remote-connection service available to faculty and staff who are traveling outside the Cambridge/Boston area and need to connect to MITnet and the Internet. iPass works anywhere in the U.S. and in over 150 countries.

Depending on where you are, what local service is available, and how your laptop is set up, the iPass connection mode can be wireless or wired broadband (Ethernet), or dialup through a modem (analog or ISDN).

When you launch iPassConnect and enter your current location, available connection options for each mode are displayed. The iPassConnect Phonebook is a directory of global access points; you can bookmark access points that you use repeatedly. Each time you connect with iPass, if an update to the Phonebook is available, you will be prompted to download it.

For faster downloading of the Phonebook, IS&T recommends that you launch iPass before you travel – while connected to MITnet on campus or through another high-speed Internet service.

Registration

Faculty and staff who wish to use iPass must register with an MIT account number, and then install the iPassConnect client software on their laptop. MIT's iPass service is usage-based, so you're charged only for actual connection time; the iPassConnect client is free and there are no startup or monthly fees. For dialup mode, connection is usually through a local access number wherever you are located, so you should not incur long-distance charges.

When you connect with iPass, you enter your Kerberos username and password, which authenticates you to MIT's iPass server and sets up a secure, encrypted connection. IS&T recommends that you also run Virtual Private Network (VPN) in conjunction with iPass, especially if you need to get to network-based applications that require an MITnet IP address.

For details on registering for an iPass account, obtaining the client software, and using iPass, go to **itinfo.mit.edu/product.php?name=ipass**.

Which Remote Option?

When off campus, you may have several alternatives for remote connection to MITnet and the Internet. Which alternative is the most efficient and cost effective will depend on your remote location.

For connecting from your home, the most common option is a commercial Internet service provider (ISP) offering high-speed access. If you don't use an ISP, MIT offers Tether, a remote-access dialup service which gives you an IP address on MITnet. Tether supports Point-to-Point Protocol over analog lines at a maximum speed of 56 kbps. Tether only has a phone number in Cambridge, so calls from outside the area will incur a toll charge.

When away from campus and home, look for free WiFi hotspots. Many businesses – including eateries and coffee shops, hotels, airports, and convention centers – provide free wireless connectivity to their customers, guests, or the general public.

If a free connection is not available, then go with iPassConnect.

Support

For help with iPassConnect or other methods of remote access, contact the Computing Help Desk at 617.253.1101 or computing-help@mit.edu. §

Bits and Bytes

This column presents announcements about IS&T-supported software. For more information about recent releases, see **web.mit.edu/swrt**.

SecureCRT and SecureFX 6.0.3 Now Available

IS&T recently released SecureCRT and SecureFX 6.0.3 for Windows. SecureCRT is a 32-bit terminal emulator designed for Internet use with support for Secure Shell (SSH). SecureFX is a secure file transfer application that uses the SSH2 protocol. Integration between the applications has been improved, and both feature new options for customizing the user interface.

SecureCRT and SecureFX 6.0.3 are available via a single, unified installer on the MIT Software site at **web.mit.edu/software/win.html**. For more information, see IS&T's related product pages:

SecureCRT
itinfo.mit.edu/product.php?vid=543

SecureFX
itinfo.mit.edu/product.php?vid=805

Update on RHEL 5.2

Red Hat Enterprise Linux 5.2 (RHEL 5.2) contains many key user-visible differences not normally delivered between major releases. IS&T has tested the Linux applications available via the MIT Software site against a fresh install of RHEL 5.2 and a system that would have auto-updated as a consequence of a Red Hat Network subscription. All tests were successful.

To guide users during their transition to RHEL 5.2, IS&T has posted documentation about several components:

Firefox 3.0
itinfo.mit.edu/product.php?vid=808

Acrobat Reader 8.x
itinfo.mit.edu/product.php?vid=809

Evolution 2.12.x
itinfo.mit.edu/product.php?vid=807

ATI Graphics Drivers
itinfo.mit.edu/article.php?id=8504#ati

For more information about RHEL 5.2, see **itinfo.mit.edu/product.php?vid=806**. §

Safe Computing

New to MIT? Read This Quick Primer on Computer Security

• **Monique Yeaton**

If you're new to MIT, you may notice that the way your computer connects with the information technology (IT) environment is different than at your former workplace or school. At many organizations, users are limited in terms of what they can do over the network: an IT administrator may have managed your computer's upgrades or patches, or the networks you were on may have been protected by a firewall that restricted access.

How Is MIT Different?

Unlike many other environments, MIT

- Does not have one person whose responsibility is information security
- Does not have a complete inventory of which assets need to be protected
- Hosts many separately managed networks
- Has a culture of autonomy to promote research and education

Together, these factors make it difficult to implement overarching IT security solutions, whether technological or procedural. However, different types of assets are individually classified, and if determined to be of high risk, are protected in a manner commensurate with their sensitivity and in accordance with MIT policy.

What Are the Risks?

The Institute relies on electronic information for academic, research, and outreach programs, as well as for support services. Protecting this information is important. However, it's also important that the valuable work of faculty, students, and staff can be shared in an open environment.

To foster the flow of information, MIT's main network, MITnet, does not have a firewall. Many computers are not managed by an IT administrator or set up in advance with limited account privileges. Therefore, what you do with your personal or work computer at MIT is your responsibility. This freedom carries with it higher risks in terms of protecting information.

The threats to computer security are both internal and external. Internal threats include insecure systems resulting from unlocked computer rooms, passwords posted on monitors, the lack of antivirus software, or inadvertent download of malicious code. External threats can include phishing emails or targeted attacks.

Best Practices

Because of the unique computing environment at MIT, all members of the community share responsibility for IT security. By staying aware and applying best practices, you can be a part of the security solution.

To learn more about IT security at MIT, go to **web.mit.edu/security**. For guidance on protecting sensitive information, see **web.mit.edu/infoprotect**. §

New Cancellation Fee for IS&T's No-Cost, Hands-on Courses

• **Kate Kibbee and Esther Yanow**

Computer training at no cost? Now there's a good deal! In addition to its no-fee Quick Start classes, IS&T offers many of its hands-on training courses to the MIT community for free. These include courses that cover software basics and new features. Among them are classes on

- *Administrative applications:* SAP, COEUS Lite and Premium, and Stellar
- *Microsoft Office programs:* Word, Excel, and PowerPoint
- *Operating systems:* Windows Vista and Mac OS X 10.5
- *Database tools:* BrioQuery and FileMaker Pro

While there is no charge for these classes, registration in advance is required to ensure

that each participant has a seat and a computer. Also, through the registration process, IS&T's Training Team knows how many handouts to prepare and is able to manage course waiting lists. Because the hands-on courses are popular, they often do have waiting lists.

Now here's the dilemma.

Sometimes individuals enroll in a class, then realize they can't attend but forget to cancel; they sign up, but do not show up. Without notification of cancellations, the Training Team doesn't have an opportunity to contact people on the waiting list. Fewer attendees get to benefit from the course.

New Cancellation Fee

To minimize the number of "no shows," the Training Team is introducing a new cancellation fee for no-cost classes. If registrants cancel at least five business days before the no-cost class, there will be no fee.

However, if they cancel less than five business days before the class, or do not show up, there will be a $50 cancellation fee and their department will be charged. This cancellation fee for no-cost courses will take effect November 1, 2008.

Registered participants who are unable to attend a course due to an emergency should have their manager or a department representative email the IS&T Training Registrar at istrain-reg@mit.edu (or call 617.253.7685) before 9 a.m. on the day of the course, or two hours before the start of an afternoon course. If the registered participant is unable to attend, a substitute is welcome to take his or her place.

To cancel enrollment in a class online, go to SAPweb Self-Service at **web.mit.edu/sapwebss/PS1/home.shtml**. Click on the Training tab and choose "My Training."

Note: The cancellation policy for IS&T's fee-based classes has not changed; for details, see **web.mit.edu/ist/topics/training/registration.html**. §

Tech Tips: VMware

This column presents tips about computing. For more information technology Q&As, check the IS&T Stock Answers database at **itinfo.mit.edu/answer**.

Q. When it comes to running Windows on my Macintosh, does VMware offer any advantages over Apple's Boot Camp?

A. With Boot Camp, you need to reboot your computer each time you want to change operating systems. This can be very time consuming. VMware eliminates the need to reboot your computer with each operating system change.

Q. I want to run Windows on my Apple computer. Does MIT provide a copy of Windows to the community?

A. Users can download both Windows XP and Windows Vista free of charge at **web.mit.edu/software**. The service is provided as part of the Microsoft Campus Agreement. For details about the agreement, visit **web.mit.edu/ist/topics/software/msca.html**.

Q. Is there a way to have VMware launch when starting up my Mac?

A. If you go to **System Preferences> Accounts**, then choose your username and **Login Items**, you can select applications or documents to open at login. You can, of course, put a virtual machine here too.

Q. Is there a way to keep the settings of a virtual machine I've created so that I can restore it in case of machine failure?

A. To make a backup copy of a virtual machine, copy the folder to another location (flash drive, CD, external drive). When you power on the copy, you will be asked if you have moved the virtual machine or copied it. Select the **Moved It** option. This will keep all of the settings the same.

Q. Why is the time wrong in my virtual machine (VMware)?

A. This is a common occurrence and can have a variety of causes. An effective way to address it is to install VMware Tools in the virtual machine and turn on time synchronization via the **Options>Miscellaneous Options** tab.

You should not use other forms of clock synchronization, including Windows Time service or MIT's Network Time Protocol (NTP) server, time.mit.edu. For more information, see **kb.vmware.com/kb/1318**.

Q. Will VMware Workstation and Fusion notify me if there is an updated version?

A. Yes. VMware automatically checks for updates. §

Telephone Talk

MITvoip Customers Can Access Many Options via the Web

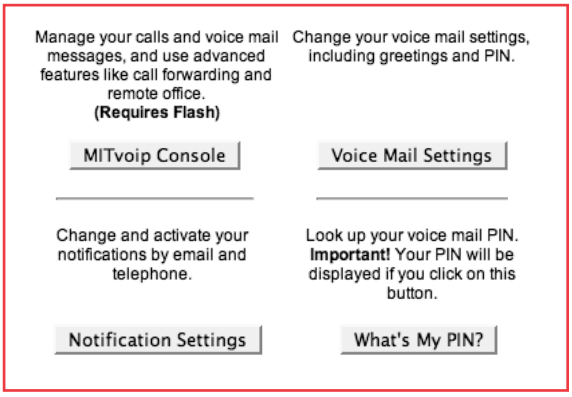
• **Lisa Gay**

The campuswide rollout of MITvoip is under way, bringing Voice over Internet Protocol (VoIP) technology to MIT. VoIP allows telephone services to run on MITnet, the campus Internet infrastructure. Uniting voice and data on a single network opens new possibilities for integrated communications.

MITvoip Web Interface

MITvoip's integrated functionality makes it possible to access many service features online. The MITvoip Web Interface lets you listen to your messages, set up conference calls, and more – all via the Web.

MITvoip customers can access the Web interface at **sylantro.mit.edu** (certificates and Flash plug-in required). Four applications are available: MITvoip Console, Voice Mail Settings, Notification Settings, and What's My Pin?.



The MITvoip Web Interface

MITvoip Console

The MITvoip Console is where you'll find most of the tools you would use day to day, such as voice mail on the Web, call forwarding, and "find me/follow me" features.

The MITvoip Console supports conference calls for up to six parties. You enter the numbers of all the parties and the system calls them; you are connected to the conference when you answer your phone. Using the MITvoip Console, you can monitor the status of all parties on the call.

Voice Mail Settings

Use the Voice Mail Settings tools to change your personal identification number (PIN), configure voice mail options, and create or delete sub-mailboxes.

Notification Settings

One of MITvoip's most popular features is the ability to receive voice mail messages as audio file attachments sent to your email address. Use the Notification Settings tool to configure this option. You can also receive a notification-only email that doesn't include the audio file attachment.

What's My PIN?

Clicking this button displays your voice mail PIN.

Training and Support

IS&T has developed online training demos for MITvoip customers. These are available at **web.mit.edu/ist/topics/voip/demos**.

If you have questions about MITvoip, send email to voip-transition-team@mit.edu. §

In StEP: Working with the UN to Solve the E-waste Problem

• **Robyn Fizz**

Computers, monitors, cell phones, handhelds – around the world, people are hooked on electronic gadgets and gear. But where does all this equipment end up when it loses its luster? What happens to components that contain toxic materials?

First StEPs

Handling of electronics waste, or e-waste, is an international concern – one with technological, economic, environmental, and social aspects. While the number of electronic devices in use is far greater in the developed world, much of the manufacturing and recycling occurs in the developing world.

In 2007, to facilitate the sustainable handling of e-waste, the United Nations University launched the Solving the E-waste Problem (StEP) initiative. Its members include stakeholders from industry, government, universities, and other organizations.

Two MIT faculty in the Material Systems Laboratory serve as StEP's North American representatives: Randolph Kirchain, a professor in the Department of Materials Science and the Engineering Systems Division, and Jeremy Gregory, a research scientist in the MIT Energy Initiative. Both work on the Task Force on Policy and Legislation and the Task Force on Recycling.

Policy and Legislation

A top priority for the Policy Task Force is to produce a white paper on implementing e-waste policy. This document will outline options for collecting and managing e-waste when setting up recycling systems.

Many countries are eager to establish processes to deal with e-waste, says Gregory, but they face financial constraints and lack expertise in handling materials. The costs of processing usually exceed revenues from scrap materials, and toxic components can be hard to extract.

The European Union (EU) has effective electronics recycling policies in place, but elsewhere in the world these processes are hit or miss. The StEP Policy Task Force is evaluating the EU's practices and drawing up guidelines that take into account circumstances in both developing and developed countries.

For starters, there are questions concerning the collection of e-waste. Who should pay for this: the manufacturers, those who buy the equipment, or those who dispose of it at the end of its life cycle? What are the best ways to regulate collection?

Disposal of e-waste is another area of concern. Some items can be dismantled by hand, while others pose serious health risks to workers. It's safer and more efficient to toss e-waste into giant automated shredders that can sort materials into streams of steel, plastics, and glass, but these facilities aren't always feasible, especially in countries that don't have robust infrastructures.

The Policy Task Force is a developing a database of worldwide best practices for e-waste management policies and is working with other stakeholders to improve international agreements banning the export of e-waste to developing countries.

Recycling

Kirchain and Gregory are also involved with the StEP's Task Force on Recycling, and two projects in particular – Future Options for CRT Glass and The Best of Two Worlds.

In developed countries, there's no longer a market for monitors or TVs that contain cathode ray tubes (CRTs). This complicates the recycling of CRT glass, which has lead in it. The preferred option has been to use scrap cullet (broken glass) from CRTs to make new CRTs.

For now, there's still demand for CRTs in the developing world, mostly for TVs, because of their lower costs compared to flat-panel TVs. The Recycling Task Force is assessing how to responsibly transfer scrap cullet from the developed world to the developing world. In addition, since the task force estimates that the demand for scrap cullet will collapse in 10 years or so, it is looking into alternative uses for end-of-life CRTs.

The Best of Two Worlds project is taking a global perspective on the optimal disassembly of e-waste. One of the big questions is how far the developing world can go in terms of effective manual disassembly. (Even if the developed world stopped shipping its e-waste overseas, the developing world is creating its own.)

Manual disassembly is generally a good thing – the more that products can be disassembled, the purer the scrap streams. And the work does provide income to laborers in poor countries. But there comes a point where further processing, particularly to get precious metals like gold, silver, and platinum, can be lethal. Acid baths, mercury, and open-pit fires are toxic to people and the environment.

From the local perspective, developing countries don't want to lose out on the precious metals part of the value chain. But these profits pale against the cost in lives and pollution. The precious metals in e-waste are best handled by technologically advanced smelters. However, due to economies of scale, there are only three of these in the world.

All in all, it's a complex issue. That's why, according to Kirchain, an international initiative like StEP is such an important resource. The Task Force on Recycling is able to do unbiased research that can contribute to thoughtful decision-making in this arena.

StEPwise

All of StEP's five task forces – Policy and Legislation, Redesign, Reuse, Recycling, and Capacity Building – benefit from the participation of diverse stakeholders. To find out more about StEP's work, visit **www.step-initiative.org**. §

Getting Help

If you don't know where to get help for your computer, network, or telephone problems, dial one of the help lines listed to the right.

If you prefer to use email, you can send your questions to the corresponding email addresses. (When logged into Athena, you can also use the **olc** command to send questions to Athena's online consultants.)

You can also submit a question online via the Request Tracker link on the Getting Help page at **web.mit.edu/ist/help**.

For help with...	Dial...	Or send a message to...
General computing questions Macintosh, Windows, network/ connectivity, business applications, computer buying advice, repairs	617.253.1101	computing-help@mit.edu
Athena computing environment	617.253.4435	olc@mit.edu
Disabilities and computing	617.253.7808	atic@mit.edu
Telephone support and repairs Traditional and MITvoip phones	617.253.4357	telephone-help@mit.edu
Traditional phone moves/changes For use by AOs/DLC administrators	617.253.3670	telecom-csr@mit.edu
Unix/Linux	617.253.1103	unix-linux-help@mit.edu

Surf Sites: Educational Games

Among other assignments, Eric Klopfer and his group at the Scheller Teacher Education Program (STEP) design and research mobile learning games, with a focus on science and math (see lead article). Based on this work, Klopfer has written a persuasive book, *Augmented Learning*, that demonstrates how mobile devices are an ideal tool for collaborative learning in the information age.

If you're curious about the intersection of digital games and education, including mobile games, check out the sites listed on the right.

Digiplay Initiative – Understanding Digital Games
digiplay.info

Education Arcade
educationarcade.org

Educational Games Research
edugamesblog.wordpress.com

Future Lab – Innovation in Education
futurelab.org.uk

Lifelong Kindergarten
llk.media.mit.edu

Nobel Prize – Educational Games
nobelprize.org/educational_games

Research Quest
researchquest.blogspot.com

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