Electronic Classrooms at the University of Toronto

Final Report by the Academic Computing Advisory Committee's
Subcommittee on Classroom Technology Standards
30 April 2007

Contents

Summary

In September of 2005, the Academic Computing Advisory Committee (ACAC) struck a subcommittee to recommend minimum classroom technology standards for all UofT classrooms by 2010. The subcommittee focused on three main objectives:

- to implement previous University recommendations to provide uniform access to standard classroom technologies across the campuses;
- to facilitate instructor use of existing and future classroom technologies;
- to improve the educational experience of our students, especially undergraduates.

To realize these objectives, the subcommittee makes six recommendations:

1. *The committee recommends a standard University of Toronto Teaching Station with a simple touch-panel control accessed by UTORid.*
2. *The committee recommends providing classroom technical support through a first-response help and dispatch centre accessible by the Station's intercom.*
3. *The committee recommends the creation of an independent, dynamic classroom network connecting all classrooms that seat 36 or more students.*
4. *The committee recommends an initial implementation of the Teaching Station and classroom network in lecture theatres with a capacity of 100 or more.*
5. *The committee recommends equipping all flat-floor classrooms that seat between 36 and 100 with a digital projector.*
6. *The committee recommends establishing a permanent University steering committee to monitor standards for classroom technologies.*

The 100+ classrooms at all three campuses and the Federated Universities in the initial implementation have a total seating capacity of almost 20,000 students, every teaching hour of every teaching day. Installing and supporting instructional technologies in these classrooms offers an exemplary realization of the top priority in *Stepping UP*, to enhance student experience.

The initial implementation of this proposal in 100+ lecture theatres requires a one-time commitment spread over 2007, 2008, and 2009 of $4.2 million and (by 2010) $659,000 annually to equip, support, and evergreen 97 classrooms: an average cost of $43,100 a room, $6,800 a room annually. Implementation in the University's 189 classrooms that seat between 36 and 100 requires an additional commitment spread over 2009 and 2010 of $2.3 million and $278,000 annually (by 2011), a room cost of $12,000 OTO and $1,470 annually.

Together, the capital and annual budget commitments in this proposal ensure that after 2010, the University will incur no significant new costs for classroom technologies in its existing classrooms.

Background

Over the last seven years every major report related to teaching at the University of Toronto has recommended equipping our classrooms for technology-assisted teaching. In the words of the 2000 *Report of the Task Force on Academic Computing and New Media*:

> Access to academic computing resources within the classroom environment should be available across campus; this should be standard, simple to use, and well supported centrally. Access should be a given as is lighting and electricity. (III.2a).

Since this report, many of our classrooms have been equipped with new or updated technology. But the work has largely been carried out on an ad hoc, unit-by-unit basis—when, where, and to the extent that individual budgets permit.

Any member of the teaching faculty at the University of Toronto is familiar with the consequences of this piecemeal approach. Some of our classrooms have some teaching technologies. Most have none. Classrooms are equipped and configured differently across the university. Instructors must access locked cabinets and electronic podiums through a maze of room-specific keys, ID cards, and passwords. Many classrooms have no instructor access to the network; others connect through a static address requiring several twelve-digit numbers. Support for classroom technology varies widely between units, between buildings, even from day to night.

In sum, most instructors do not know what technologies to expect or how to use them when they walk into their classrooms at the beginning of each term. We have fulfilled part of the recommendation of the *Thomson Report*, but we have neglected its real emphasis and importance: that classroom technologies should be standard, uniformly available, and centrally supported. Because we cannot guarantee uniform access by our instructors to uniformly equipped classrooms from term to term, there is little incentive and indeed a powerful *dis*incentive for faculty to use or develop technologies that might enhance the student experience.

In September of 2005, the Academic Computing Advisory Committee struck a subcommittee to address this situation by recommending minimum classroom technology standards for University of Toronto classrooms by 2010. The subcommittee presented its report to ACAC in January 2006. The Chair of ACAC, Vice-Provost Safwat Zaky (Planning and Budget), then asked a reconfigured version of the subcommittee to develop an implementation plan and budget for its recommendations. The subcommittee submitted a preliminary report on 25 May 2006 and here submits its final report, implementation plan, and budget.

Consultation

The Subcommittee on Classroom Technology Standards is composed of senior representatives from Computing and Network Services, the Provost's office, Campus and Facilities Planning, the Office of Teaching Advancement and Faculties of Medicine and Arts and Science at St. George, and space management/classroom technology support offices at all three campuses. The committee is chaired by a junior and very tired member of the University's teaching faculty.

The committee has consulted and made its recommendations consistent with:

- Office of the Vice-President and Provost, *Stepping UP* (2004), Appendix B, Information Technology Objective
- Office of the Vice-President and Provost, *Report of the Task Force on Technology-Assisted Education* (2001)
- Office of the Vice-President and Provost, *Report of the Task Force on Academic Computing and New Media (The Thomson Report)* (2000)
- Working Committee for Classroom Design Criteria, *Design Criteria for Classrooms on the St. George Campus* (2005)
- Association of Ontario University Education Technology Directors, *Guidelines and Specifications for New Classroom Construction or Renovation* (2001)
- University of Toronto Facilities and Services Department and Capital Projects Division, *Design Standards*
- Charles George Ramsay, *Architectural Graphic Standards*, 10th ed. (2000)

The prototype Teaching Station was first displayed at the University's Teaching and Learning Symposium on 30 October 2006. It then spent a week at each of the three campuses, collecting feedback from faculty and staff in response to an invitation from Vice-Provost Safwat Zaky (PDAD&C Memo, 2 Nov. 2006).

The response to the prototype Station has been extremely positive. Although individuals disagree about what exactly the standards should be for classroom technology, everyone who responded endorses the *need* for standards and the direction of the committee's recommendations. Faculty and staff seemed most pleased with, in order: (1) the establishment of consistent standards; (2) access to the Station by UTORid; and (3) the intercom connection to technical support. For the committee's responses to specific feedback on the prototype, see Appendix A.

The committee has presented regular updates on its progress to the Academic Computing Advisory Committee (17 January, 6 June, 4 Oct. 2006, 11 April 2007); the Computing Management Board (16 March 2006); the Principals, Deans, Academic Directors and Chairs (27 April 2006); the Chairs and Directors of the Faculty of Applied Science and Engineering (21 Nov. 2006); the Chairs, Principals, and Academic Directors of Arts and Science (24 Nov. 2006), and the Council on Student Experience (30 Nov. 2006).

Recommendation 1: The UofT Teaching Station

The committee recommends a standard University of Toronto Teaching Station with a simple touch-panel control accessed by UTORid.

At the core of the committee's recommendations is a proposal for a new University of Toronto Teaching Station, an accessible electronic podium with simple, standardized connections and controls. The Station contains a basic suite of commonly used teaching software, and allows teachers to project alternative applications from a laptop or similar device. It has been designed to provide a core set of tools that every teacher can expect in every equipped room, while staying flexible enough to accommodate exceptional and future teaching technologies. Its features include:

- access to the podium and network via personal UTORid
- built-in computer equipped with PowerPoint, Excel, Word, Adobe Acrobat, Windows Media Player, and Internet Explorer with Flash player
- teachers can connect their laptop to the Station, or project files in the supported software from their memory stick using the Station's keyboard
- plug-and-go Internet connection that automatically assigns an IP address
- intercom connection to live technical support
- hearing assistance technology
- DVD/VCR player
- external inputs for auxiliary audio and video (e.g. document camera)

Teachers access and operate the Teaching Station through a Crestron touch-panel that can be diagnosed and updated from a remote, central location.[1] Appendix D provides a sample illustration of the control screen, designed and programmed to our specifications by a Crestron-certified company, Control Concepts of New Jersey. To control viruses and user modifications, the Station's internal computer will be "sealed" with a UofT-licensed program called Deep Freeze that resets the computer to its original state upon restart.

The Teaching Station itself is designed and built by an Ontario firm, 9 Digits (drawings in Appendix C). The Station includes 22" recessing wings on both sides that meet ADA requirements for accessible work surfaces, and is constructed from materials that meet the University of Toronto *Design Standards* for environmental consequences (Pt. One, Sec. 5, 1.3.3 "Material Choice"). Each Station will have the University's crest embossed on the front, facing the students. The default stain is oak, but other finishes can be requested from 9 Digits as necessary to match existing classroom woodwork.

[1]Almost all the University's existing control panels are made by Crestron, an American firm with substantial experience with educational clients. The committee considered building and programming our own touch-panel, and tested an enhanced Crestron touch-panel that contains a sealed computer, but rejected both options because of their additional expense and complexity.

Recommendation 2: Centralized Support

The committee recommends providing classroom technical support through a first-response help and dispatch centre accessible by the Station's intercom.

The first, best, and most affordable approach to classroom technical support is the standard Teaching Station, the core of our proposal. Consistent standards dramatically reduce instructor ignorance, the largest single cause of calls for technical help.

But instructors will still need professional help on occasion. The optimum structure for this help is central combined with local support, the kind of zone defence already in place at UTM. Every Teaching Station will have a two-way intercom connected over the network to technical help at its campus. At St. George, for example, the intercom connects instructors during all teaching hours with technical support at OSM who will resolve most problems using the remote diagnostic abilities of the Crestron system. If OSM staff cannot resolve the problem quickly by remote, they will dispatch the technician responsible for that building or area. This technician will in some cases be an OSM employee, but in other cases s/he will work for other units.

This recommendation will require additional, ongoing human resources for central technical support, specified in the Budget. It will also require the cooperation of and minor adjustments to the job descriptions of local support staff, and would therefore require and benefit from consultation with the Deans and Principals.[2]

Recommendation 3: Independent Classroom Network

The committee recommends the creation of an independent, dynamic classroom network connecting all classrooms that seat 36 or more students.

Electronic classrooms require network connectivity for three purposes: to allow for remote diagnosis and control; to connect the intercom to technical support; and to allow the instructor to connect to the campus network and the Internet.

The committee recommends an independent classroom network to meet these requirements. A consistent recommendation of past University reports, an independent classroom network has several advantages over the existing mélange of classroom access through various departmental networks. At present, different departmental networks provide different levels of access, sometimes to different instructors. An independent classroom network gives instructors from all units uniform access to a network of uniform performance and stability. It reduces the load on departmental networks, and allows for focussed management of a dedicated classroom network. Finally, connecting to this network through a dynamic rather than a static IP address removes the serious impediment of the instructor having to know and enter a unique IP address for each room.

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[2]Some of these discussions have already taken place. For instance, at a meeting on 22 March 2007, representatives from Victoria University and this committee agreed to the central/local support model proposed above, OSM help combined with Vic support staff when necessary.

In 100+ lecture theatres equipped with the Teaching Station, the network will be secured by granting network access concurrently with access to the Station by UTORid through the control screen. In 36-100 capacity flat-floor classrooms, connecting a laptop to the network will prompt a UTORid request on the user's laptop. The network will be secured according to the following hierarchy:

- faculty, staff, and graduate students authorized by default
- undergraduates not authorized by default but can be temporarily authorized
- guest users (i.e. not part of the university community) temporarily authorized through the new Guest UTORid

Recommendation 4: Implementation Plan for 100+ Capacity Classrooms

The committee recommends an initial implementation of the Teaching Station and classroom network in lecture theatres with a capacity of 100 or more.

The committee recommends equipping all University of Toronto classrooms by 2010 according to the following guidelines:

Equipment	**seminar (<35)**	**flat classroom (36-100)**	**lecture theatre (100-200)**	**lecture hall (200+)**
Teaching Station			●	●
room lighting controls on TS				●
blackboard	●	●	●	●
projector screen	●	●		
two projector screens			●	●
overhead projector	●	●	●	●
digital projector		●	●	●
speakers		●	●	●
wireless microphone			●	●

The committee recommends an initial implementation of these guidelines in lecture theatres with a seating capacity of approximately 100 or more, a first step designed to eliminate the expense and difficulty of providing portable equipment in large rooms, to support the technology-dependent methods of large-class instructors, and to deliver the quickest benefit to the greatest number of students.

Because our primary mandate is to remove barriers to technology-assisted teaching, we have concentrated resources on under-resourced, centrally allocated classrooms available to users from multiple divisions. At St. George, this definition includes classrooms in the Federated Universities, but not classrooms in single-department faculties. For this initial implementation, we have therefore not included 100+ lecture theatres in Architecture (1), Dentistry (3), Law (2), Music (2), or Rotman (none). However, we recommend sharing this proposal with the Deans of these faculties.

This initial implementation targets lecture theatres with a capacity of approximately 100 or more at all three campuses and the Federated Universities: St. George (66), UTM (12), UTSC (10), Victoria (5), St. Michael's (3), and Trinity (1), for a total of 97 rooms. The committee recognizes the autonomy of the Federated Universities, but has included their classrooms in its planning because of their regular use by the University as well as strong support for this proposal by Federated Universities' instructors and administrators.

Recommendation 5: Implementation Plan for 36-100 Capacity Classrooms

The committee recommends equipping all flat-floor classrooms that seat between 36 and 100 with a digital projector.

To maximise resources and give most teachers what they most want—the ability to project their work, to connect to the network, and to call for help if they can't—the committee recommends equipping all flat-floor 36-100 capacity classrooms with a ceiling-mounted digital projector and related equipment:

- VGA, audio, and Internet connections
- access to network via personal UTORid[3]
- controls and connections provided by wall-mounted Crestron Media Manager with remote diagnostic functionality
- accessible input jacks for auxiliary video and microphone
- intercom connection to live technical support
- amplifier and speakers

As with the committee's recommendations for 100+ lecture theatres, these are *minimum* standards. For instance, they do not preclude installing the Teaching Station in a flat-floor classroom where warranted by ongoing need. Further, the line between a flat-floor classroom and lecture theatre should be flexible, i.e. drawn around rather than precisely at 100 seats, and be determined by room design as well as capacity.

This implementation targets 36-100 capacity flat-floor classrooms at all three campuses and the three Federated Universities: St. George (107[4]), UTM (30), UTSC (25), Victoria (13), St. Michael's (10), and Trinity (4), for a total of 189 rooms. The implementation schedule gives priority to the 100+ classrooms, but to benefit from economies of scale for both equipment and installation (especially connectivity), the two plans might be better executed in parallel rather than consecutively.

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[3]Connecting a laptop or similar device to the Internet connection will prompt a request for UTORid on the teacher's laptop. Disconnecting the laptop will log the teacher off.

[4]This count includes only centrally allocated classrooms, i.e. not reserved classrooms in single-department faculties. It includes 36-100 capacity classrooms in Bahen, Bancroft, Bissell, FitzGerald, Galbraith, Haultain, Health Sciences, Innis, Lash Miller, McLennan, Medical Sciences, 50 St George, OISE, Hughes, Leslie Dan, Rosebrugh, Wright, Fleming, Sid Smith, University College, Wallberg, Wilson Hall, Woodsworth Residence, and Woodsworth College.

Budget

Seven years ago, an electronic classroom cost upwards of $100,000. But the cost of classroom technologies have fallen as supplies stabilize and demand increases. Today, for a 100+ lecture theatre that currently has no equipment and can accommodate all of the recommended equipment, the estimated cost to install and connect the Teaching Station and its peripherals is $55,600. And this is a worst-case example, a room that requires an accessory lens ($2,000) and a scissor lift for its projector ($8,500). Additional savings result from reusing existing classroom equipment where possible.

Assuming no reusable equipment, the cost to equip 36-100 capacity classrooms with a digital projector and related equipment is $8,000 for equipment and installation and $4,000 for network connection, a total of $12,000 per room.

The Office of Space Management at **St. George** has presented a budget of $2,862,867 to install the Teaching Station and its peripherals in the sixty-six 100+ centrally allocated lecture theatres and nine 100+ Federated Universities theatres (Appendix F). Computing and Network Services has presented a budget of $370,800 to connect these rooms to an independent classroom network (Appendix G). The average cost per room to install and connect the Teaching Station in St. George's seventy-five 100+ rooms is $43,120.

MicroElectronics at **UTM** has presented a budget of $521,745 to install and connect the Teaching Station and its peripherals in each of its twelve 100+ lecture theatres, an average cost of $43,480 per room (Appendices H and I).

Information & Instructional Technology Services at **UTSC** has presented a budget to install and connect the Teaching Station and its peripherals in its ten 100+ lecture theatres for $424,554, an average cost of $42,460 per room. (Appendix J).

The total capital costs for implementation in all 100+ capacity theatres are:

	Network Connection	**Equipment/Installation**	**Total**
St George (66)	$315,900	$2,528,100	$2,844,000
UTM (12)	$13,224	$508,521	$521,745
UTSC (10)	$55,000	$369,554	$424,554
Feds (9)	$54,900	$334,767	$389,667
Total (97)	*$439,024*	*$3,740,942*	***$4,179,966***

The total capital costs for implementation in all 36-100 capacity classrooms are:

	Network Connection	**Equipment/Installation**	**Total**
St George (107)	$428,000	$856,000	$1,284,000
UTM (30)	$120,000	$240,000	$360,000
UTSC (25)	$100,000	$200,000	$300,000
Feds (27)	$108,000	$216,000	$324,000
Total (189)	*$756,000*	*$1,512,000*	***$2,268,000***

Annual Costs

Besides the capital costs, it is essential to commit to an annual budget for support, maintenance, and evergreening of classroom equipment. From a teacher's point of view, *inadequate classroom support or poorly maintained classroom technology are worse than having no classroom technology at all.* Evergreening effectively eliminates new capital or annual costs for classroom technologies in the University's existing classrooms. (In an evergreening budget, component replacement costs can be redirected from existing to new technology, with "new" defined in this context—classrooms in a public university—as proven rather than emerging technology.)

To project evergreening costs, the Office of Space Management calculated the lifespan of each major component and its replacement cost. For instance, bulbs for data projectors last about a year, and cost $600 each. So if we install 30 projectors in 2007, we will need $18,000 to replace bulbs in 2008. Evergreening costs increase as we add rooms and longer-lasting equipment reaches the end of its life span. Two funding options present themselves: (1) to increase annual base budgets for the classroom technology support offices as replacement costs increase; or (2) to increase their base budgets by the average annual replacement cost over the life-span of the longest-lasting component. For the sake of this budget we have assumed the second option, calculated at an average annual evergreening cost of $3,400 per room for 100+ lecture theatres and $1,470 per room for 36-100 flat-floor classrooms.

Based on established support levels, the Office of Space Management at **St George** calculates that to meet the committee's recommendations it will require an additional 1.0 FTEs for network management and programming, 0.9 FTEs for A/V support, and 1.6 FTEs for help desk support: a total of 3.5 FTEs for an annual cost of $179,600, including benefits. With this additional support, OSM is committed in principle to eliminating its current practice of recovering support and maintenance costs by charging teachers for their use of classroom technologies, a savings in annual operating costs (as well as accounting labour) for departments throughout St. George of about $300,000 a year. (UTM and UTSC do not currently recover costs from teachers.) Because of the phased implementation of this plan and OSM's current dependence on this income to provide classroom support, user fees cannot be eliminated immediately. OSM will review its operating costs for classroom support as implementation proceeds, with a commitment to eliminate user fees by 2010.

Hosting the new ClassNet at CNS will require 1.0 FTE programmer at an annual cost of $70,000 including benefits. It will also require an annual increase to CNS's base budget of $11,000 for maintenance of the network switches, $12,800 for the Windows Institutional Server Support Team for server support, and $1,500 for institutional backup service, for a total annual cost of $95,300.

Like St. George, **UTM** will require a server to communicate with and monitor their Teaching Stations, a one-time cost of $6,000 plus $1,000 annually. Because classroom support is already centralized at UTM, they require only an additional 0.5

FTE casual position, an annual cost including benefits of $24,115. **UTSC** requires $2,475 annually for server maintenance and an additional 0.5 FTE for classroom support at an annual cost of $27, 210 (Appendix J).

In 2007 dollars, the projected annual costs by 2011 to support, maintain, and evergreen the University's 97 lecture theatres and 189 flat-floor classrooms are:

	Network	**Support**	**Evergreen 100+***	**Evergreen 36-100***	**Total**
St George	$95,300	$179,600	$224,400 (66)	$157,290 (107)	$656,590
UTM	$1,000	$24,115	$40,800 (12)	$44,100 (30)	$110,015
UTSC	$2,475	$27,210	$34,000 (10)	$36,750 (25)	$100,435
Feds	$0	$0	$30,600 (9)	$39,690 (27)	$70,290
Total	*$98,775*	*$230,925*	*$329,800 (97)*	*$277,830 (189)*	***$937,330***

*Based on annual evergreening costs of $3,400 per 100+ room and $1,470 per 36-100 room.

Implementation Schedule

Installation opportunities in classrooms at all three campuses are rare and tight. To spread the capital costs and achieve its mandate of full implementation by 2010, the committee recommends implementation over the next four years, which requires the following total budget commitments per year:

	2007	**2008**	**2009**	**2010**	**2011 >**
OTO	$1,516,300	$1,641,500	$1,802,700	$1,524,000	$0
Annual	$284,625	$441,900	$574,500	$750,640	$937,330
Total	*$1,800,900*	*$2,083,400*	*$2,377,200*	*$2,274,600*	*$937,330*

Classroom technology support offices at the three campuses have prepared the implementation schedule and yearly budget requests on the following page to equip the University's 100+ rooms over Years 1-3 (2007-09) and its 36-100 classrooms over Years 3-4 (2009-10).

Note that the schedule for equipping Victoria's 100+ theatres has been confirmed, but the schedules for equipping 100+ theatres at Trinity and St. Michael's are at the time of this report suggestions only, to be confirmed with the respective University.

Implementation Schedule for Electronic Classrooms at the University of Toronto

(E = annual evergreening costs, based on $3,400 per 100+ room per year, $1,470 per 36-100 classroom per year)

	2007			2008		
	Rooms	**OTO**	**annual**	**Rooms**	**OTO**	**annual**
St George	BA 1130, 1160, 1170, 1180, 1190 GB 220, 221 MP 103, 203 MS 2172, 3153, 3154 SS 1069, 2102, 2117, 2118, 2135 UC 140, 161 **19)**	$776,166 OSM $90,900* CNS	$137,000 OSM(HR) $0 OSM (E) $70,000 CNS (HR) $25,300 CNS (E)	2nd third of 100+ rooms **(24)**	$916,800* OSM $114,900* CNS	$179,600 OSM (HR) $64,600 OSM (E) $70,000 CNS (HR) $25,300 CNS (E)
UTM	CCIT 1080, 1140 (Kaneff 137 South 2072, 2074 North 292 **(6)**	$263,278	$25,115 HR $0 E	South 2080, 2082, 3127 North 134, 205, 287 **(6)**	$258,468	$25,115 HR $20,400 E
UTSC	H214, H215 S128, S143 M170	$237,624	$27,210 HR $0 E	AC223 S309, S319 H216, A112 **(5)**	$186,930	$27,210 HR $19,475 E
Feds	Ignatieff Theatre (Trinity) **(5)** Bader Theatre (Vic) Brennan Hall (St. Mike's) **(3)**	$133,973 OSM $14,358* CNS	$0 OSM (E)	EM1, EM119 (Vic) AH 100, 400 (St. Mike's) **(4)**	$145,222 OSM $19,144* CNS	$10,200 OSM (E)
Total	***33 x 100+ rooms***	***$1,516,299***	***$284,625***	***39 x 100+ rooms***	***$1,641,464***	***$441,900***

	2009			2010		
	Rooms	**OTO**	**annual**	**Rooms**	**OTO**	**annual**
St George	remaining 100+ rooms 1st round of 36-100 rooms **(23) (35)**	$1,158,600* OSM $250,078* CNS	$179,600 OSM(HR) $146,200 OSM (E) $70,000 CNS (HR) $25,300 CNS (E)	remaining 36-100 rms (72)	$576,000* OSM $288,000* CNS	$179,600 OSM(HR) $275,850 OSM (E) $70,000 CNS (HR) $25,300 CNS (E)
UTM	1st round of 36-100 rooms **(10)**	$120,000*	$25,115 HR $40,800 E	remaining 36-100 rms **(20)**	$240,000*	$25,115 HR $55,500 E
UTSC	1st round of 36-100 rooms **(8)**	$96,000*	$27,210 E $36,475 HR E	remaining 36-100 rms **(17)**	$204,000*	$27,210 E $48,235 HR E
Feds	NF3, VC323 (Vic) **(2)** 1st half of 36-100 rooms **(9)**	$132,455* OSM $45,572* CNS	$23,800 OSM (E)	remaining 36-100 rms **(18)**	$144,000* OSM $72,000* CNS	$43,830 OSM (E)
Total	***25 x 100+/ 62 x 36-100 rooms***	***$1,802,705***	***$574,500***	***127 x 36- 100 rooms***	***$1,524,000***	***$750,640***

*Estimate based on St. George average costs per room: $38,200 to equip (OSM) and $4,786 to connect (CNS) 100+ capacity lecture theatres; $8,000 to equip (OMS) and $4,000 to connect (CNS) 36-100 capacity classrooms

Recommendation 6: Steering Committee for Electronic Classrooms

The committee recommends establishing a permanent University steering committee to monitor standards for classroom technologies.

This committee would monitor the implementation of this proposal over the next four years. On a permanent basis, it would be charged with monitoring, revising, and updating as necessary the standards set by this committee, as well as monitoring and investigating new classroom technologies. The committee would report to ACAC, both in an advisory capacity and, when so charged, recommend projects for University approval.

The committee recommends that this steering committee be composed of:

- two members of the teaching faculty (one as chair)
- directors of classroom technology support offices from all three campuses
- senior representatives from St. George's Computing and Network services, the Provost's Strategic Computing Office, the Office of Teaching Advancement, and the Resource Centre for Academic Technology
- senior representatives of at least three university divisions

At least one committee member should possess a working knowledge of University of Toronto *Design Standards* and provincial building codes. The committee should meet three times a year, and receive secretarial support during major projects.

Respectfully submitted by the Subcommittee on Classroom Technology Standards

Steven Bailey, Director, Office of Space Management
Monica Contreras, Assistant Dean & Director, Planning and IT, Arts and Science
Pam Gravestock, Associate Director, Office of Teaching Advancement
Avi Hyman, Director, Academic Computing, Faculty of Medicine
Ernie Lopez, Manager, Classroom Technology Support Group
Nick Mount, Assistant Professor, Department of English (Chair)
Marden Paul, Director, Strategic Computing
Shirley Roll, Director, Facilities Management & Space Planning, Faculty of Medicine
Eugene Siciunas, Director, Computing and Network Services
Anil H. Vyas, Manager, MicroElectronics, UTM
Lynval Salmon, Academic Resources, UTSC

Electronic Classrooms at the University of Toronto
Appendix A: Responses to the Prototype UofT Teaching Station

Note: This document was posted for the University community on the website of the Office of Teaching Advancement, St. George campus.

Responses to the Prototype UofT Teaching Station
Academic Computing Advisory Committee's
Subcommittee on Classroom Technology Standards
6 January 2007

The prototype Teaching Station was unveiled at the Teaching and Learning Symposium on 30 October 2006. In November, the Teaching Station spent a week at each of the three campuses. It was also presented at several meetings of Chairs and Academic Directors as well as the Council on Student Experience.

The overall response to the prototype Station and the recommendations for its implementation has been very positive. Faculty and staff were most pleased with (1) the establishment of consistent standards for classroom technologies; (2) standardized access to the Station by UTORid; and (3) the Station's intercom connection to technical support.

Faculty and staff at the three campuses made a number of specific suggestions for improving the Station. The Subcommittee on Classroom Technology Standards has considered these suggestions and will incorporate its responses into its final report to the Academic Computing Advisory Committee early this spring. If the committee's report is accepted, faculty and staff can expect to see the first round of Stations installed in targeted classrooms with a capacity of 100 or more at all three campuses during the summer of 2007.

For information's sake, we offer here a summary of the questions and suggested improvements to the prototype Station and the committee's responses. Further questions can be directed to any member of the Subcommittee on Classroom Technology Standards (listed below) or to its chair, Professor Nick Mount at nick.mount@utoronto.ca.

***Q)* Is the touch screen monitor too far back to see and reach easily?**

We modified the Station's dimensions to bring the monitor about 2" closer to the user and increase its angle from about 25 to 35 degrees. The revised reach radius and angle meet current design standards.

***Q)* Are the pull-out wings the right height for seated users, or users in a wheelchair?**

The left wing is 30 ½" above floor level, within the standard 30-34" height clearance for wheelchairs. Teachers can also sit in a standard chair under the left wing, though the working surface will be about 2" higher than a standard desk to make it wheelchair accessible. Note that the Office of Space Management and its counterparts at UTM and UTSC can provide a portable control screen for wheelchair users.

Q) **Could you increase the width of the pull-out wings to accommodate a document camera and larger documents?**

We increased the width of both wings from 18” to 22”, wide enough to accommodate newer and older document cameras.

Q) **The wings should be white so they can be used as a surface for projecting transparent overheads with a document camera.**

The Station manufacturer will surface both wings with the existing woodgrain on the top and a light grey on the bottom. Where necessary, the wings can be reversed by staff to facilitate overhead projection by portable or ceiling-mounted document cameras, as well as provide more reflectivity for video-conferencing cameras.

Q) **The lip on the reading easel is too shallow: pages can slip off.**

We increased the lip’s depth from ½” to ¾”.

Q) **Could you illuminate the DVD/VCR cabinet? In dark lecture rooms it’s difficult to see the controls.**

We will install a small LED light above the DVD/VCR cabinet. In part to improve access/visibility, we have also eliminated the locking door on the DVD/VCR cabinet.

Q) **Label all devices and jacks.**

All jacks and cables will be clearly labelled. For better visibility, we have also relocated the jack panel from the front to the top of the Station: composite video, audio in, audio out, and four USB ports.

Q) **Could the power outlet and/or VGA cables be relocated or added to the sides of the podium, so that cables from a laptop or document camera set on the wing won’t be in the teacher’s way?**

We have relocated the VGA, Internet, and audio cables together with a duplex power outlet from the front to the side of the Station (left side by default, right side when warranted by the Station’s location in a classroom).

Q) **Can I connect my Mac to the Station?**

Yes, to the VGA cable, with an adapter. Apple video connections come in three different configurations, so instructors who use Macs will have to bring their own appropriate adapter.

Q) **Why is there no DVI input? What about a FireWire connection?**

Neither Digital Video Interface (DVI) nor Apple’s FireWire have become widespread enough to justify their inclusion. The committee would prefer to let the industry arrive at standards for newer technologies before committing the university to those technologies.

Q) **Where will the keyboard and mouse for the built-in computer be stored?**

The Station will include a keyboard with a built-in touchpad mouse, installed on a pull-out keyboard tray of the same design as the wings.

Q) **The implementation calls for wireless microphones in all rooms that seat over 200, but I teach in a smaller room and I don't want to be tied to the Station's podium mike. Could all rooms have a wireless microphone?**

The committee revised the standard for wireless microphones from classrooms with a capacity of 200+ to classrooms with a capacity of 100+. The wireless microphone will be stored in a locked cabinet to the right of the DVD/VCR, unlocked by a button on the control screen.

Q) **What happens if I press the intercom for help and the line is busy?**

You'll hear a recording telling you that you're in a service queue. This shouldn't happen often: the committee expects that its overall goal of standardizing and simplifying classroom equipment will greatly reduce the need for technical help.

Q) **The software on the built-in computer is too limited. Many of us use OpenOffice for presentations, and are more used to Firefox than Explorer.**

The Station's built-in computer includes a basic suite of widely used teaching software for which the University holds affordable site licenses: PowerPoint, Excel, Word, Adobe Acrobat, Windows Media Player, and Internet Explorer with a Flash player plug-in. Teachers can access alternative or specialized applications online or from their laptop, tablet, or a bootable USB memory stick such as the MobiKEY.

Q) **Can basic PowerPoint commands be accessible on the control screen, so that teachers don't have to use the keyboard to run a PowerPoint show stored on a memory stick?**

We are exploring this option with the programmer of the control screen.
[Note: this option has been rejected because of programming expense and complexity. Users can advance PowerPoint slides with the Station's keyboard/mouse, or with their own remote, an increasingly popular and affordable option: see below.]

Q) **A remote clicker for PowerPoint slides should be standard in each room.**

Because these devices are small and inexpensive, about $60 and falling, the committee believes it's better for a teacher who wants to use one to carry his or her own and connect it to one of the Station's USB ports (no software required). Among other reasons, the instructor knows before anyone else that the battery in his or her remote requires replacing.

Q) **Can the Station accommodate the University's new i-clicker system?**

Yes. A professor who assigns clickers gets free software and a small receiver from the manufacturer through the UofT Bookstore, and then simply plugs the receiver into one of the Station's USB ports or the USB port of his/her laptop.

Q) **Could the Station include a tablet PC to allow teachers to project "handwritten" text in real time?**

Teachers can connect their own tablet to the Station, but their expense and specialized functionality preclude their adoption as standard equipment. Note that PowerPoint allows for basic on-screen notation.

Q) **Could you add an audio-out jack to allow instructors to record an audio file of their lectures on their laptop for Internet posting?**

Done. We're told Camtasia software works well for this and is relatively affordable.

Q) **Fine Arts classrooms need high-resolution projectors.**

The committee's mandate to is recommend *minimum* standards for classroom technologies; any enhancements of those minimum standards should be dealt with before installation, in consultation between the room's primary users and the office responsible for installing and maintaining the equipment. The onus will fall on OSM and its counterparts at UTM and UTSC to identify rooms that have repeated users with legitimate specific needs and enhance the standards to meet those needs. In this case, we will identify any rooms in the first implementation of 100+ used regularly by Fine Arts and budget for a high-resolution, high-contrast projector in each.

Q) **Each classroom should have a portable lectern, so that teachers aren't forced to stand behind the fixed Station—especially teachers who don't use its equipment.**

The committee added to the minimum standards for 100+ rooms a lightweight, adjustable height, portable lectern with a cup-holder at a cost of about $100 per unit.

Q) **Did the committee consider a wireless Internet connection for the podium?**

Yes. We decided against wireless for two reasons: (1) classroom teaching using the Internet requires a stable, fast source, and wireless isn't there yet; and (2) different brands of laptops use different wireless cards that must be configured by the user, whereas a wired Internet connection with a dynamic IP address doesn't require any special configuration.

Q) **Will you install the Station in a few trial rooms first, to see if anything comes up in practice that the committee hasn't anticipated?**

Yes, in part for this reason, and in part because installation opportunities times are rare and tight, so implementation will have to be staggered over three years to meet the goal of full implementation by 2010.

With thanks for your helpful suggestions—

The Subcommittee on Classroom Technology Standards

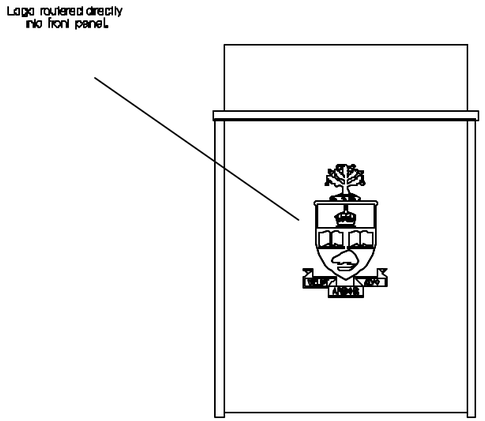
Electronic Classrooms at the University of Toronto
Appendix B: Teaching Station Specifications

Podium
- 4” toe clearance on teacher’s side
- 22” wide recessing wings on both sides within ADA range of 28”-34” above ground
- side wings surfaced with woodgrain on top, light grey on bottom (reversible to facilitate overhead projection by portable or ceiling-mounted document cameras)
- flip-up reading easel with chain to prevent hinge stress
- ¾” book lip along entire front top
- keyboard tray of same design as wings, in line with control screen
- mag-locked cabinet for wireless microphone (unlocked via control screen)
- LED light above DVD/VCR shelf
- UofT crest embossed on front
- portable lectern also supplied in every 100+ room to increase teacher flexibility

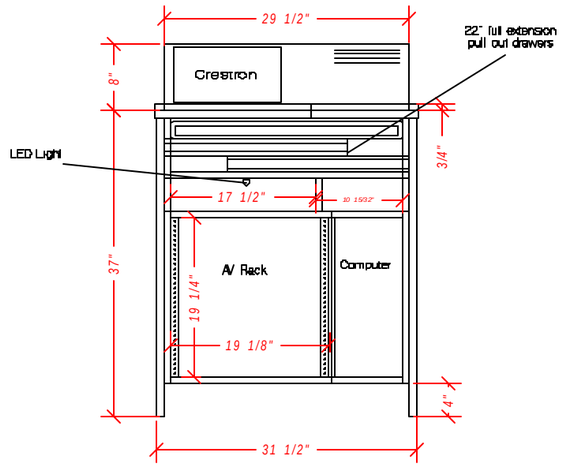
Podium Controls/Components
- Crestron PS-15G-QML touch-panel control screen
- slim profile combination keyboard/touchpad mouse (e.g. Adesso A68-1084)
- Ethernet Intercom (Digital Acoustics) labeled “Tech Help / Press and Release”
- gooseneck reading light with on/off rocker switch
- gooseneck microphone
- wireless microphone
- combination DVD/VCR player

Connections
- auxiliary jack panel on top of podium, L-R: composite video, left and right audio in, audio out, four USB ports. All clearly labeled.
- “audio out” captures all active audio, i.e. microphone(s) and source
- USB ports located on right side to ease wheelchair access, and sufficiently spaced for simultaneous use by USB devices with oversize heads
- VGA, Internet, and mini-stereo audio cable extending through grommet a few inches above left wing by default, right wing where dictated by installation
- duplex power outlet in line with cable grommet, flush, about 19” above floor

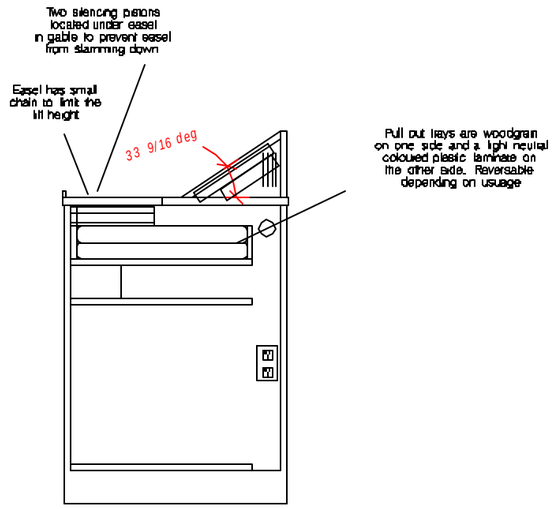
Internal Components (technician access only)
- small desktop pc equipped with Windows and MS Office Standard Edition: PowerPoint, Excel, Word, Adobe Acrobat, Media Player, and Internet Explorer with Flash player. Sealed w/ Deep Freeze, protected w/ Norton.
- Crestron control processor, Quick Media transmitter, volume controller card, and power supply
- RGBHV transmitter and receiver
- audio amplifier
- hearing assistance transmitter and receiver
- microphone feedback suppressor
- silent fan for heat exhaust: noise 24 db at 1 meter, airflow 20 CFM



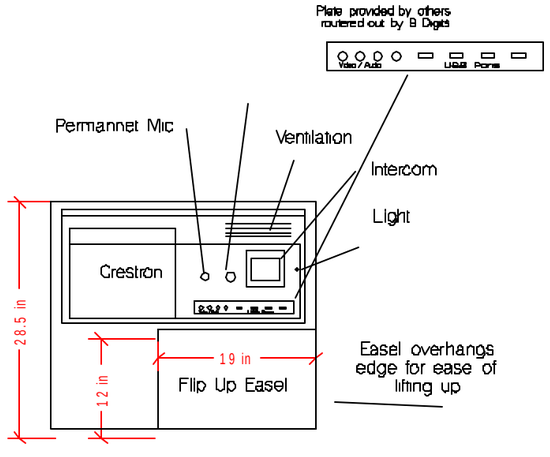
Back View

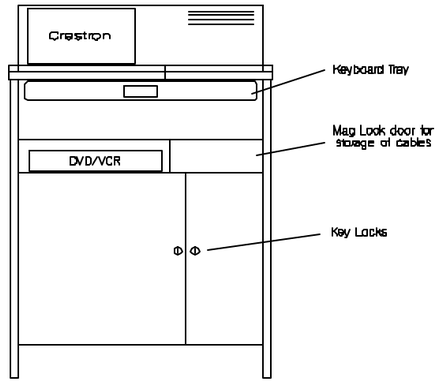


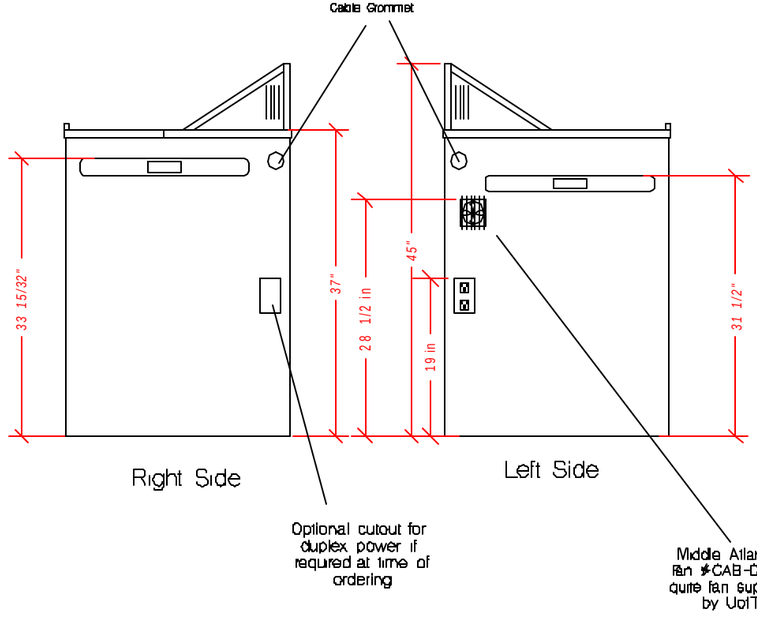
Front View
Section Through



Right Side
Section Through







9 Digits Inc.
680 Hardwick Rd Unit 6
Bolton, ON L7E 5R4
Tel. 905 951 9599
Fax: 905 951 9799

SHOP DRAWINGS

Client: University of Toronto

Drawing Title: 24 th Version of Standard Podium

Materials:
Quarter Sawn White Oak Veneer
Black melamine cabinet interior
Stain Para TimberCare Oil Stain #STB
Stain Name Oak Bay
Clear Finish Post Catylized 15% Sheen

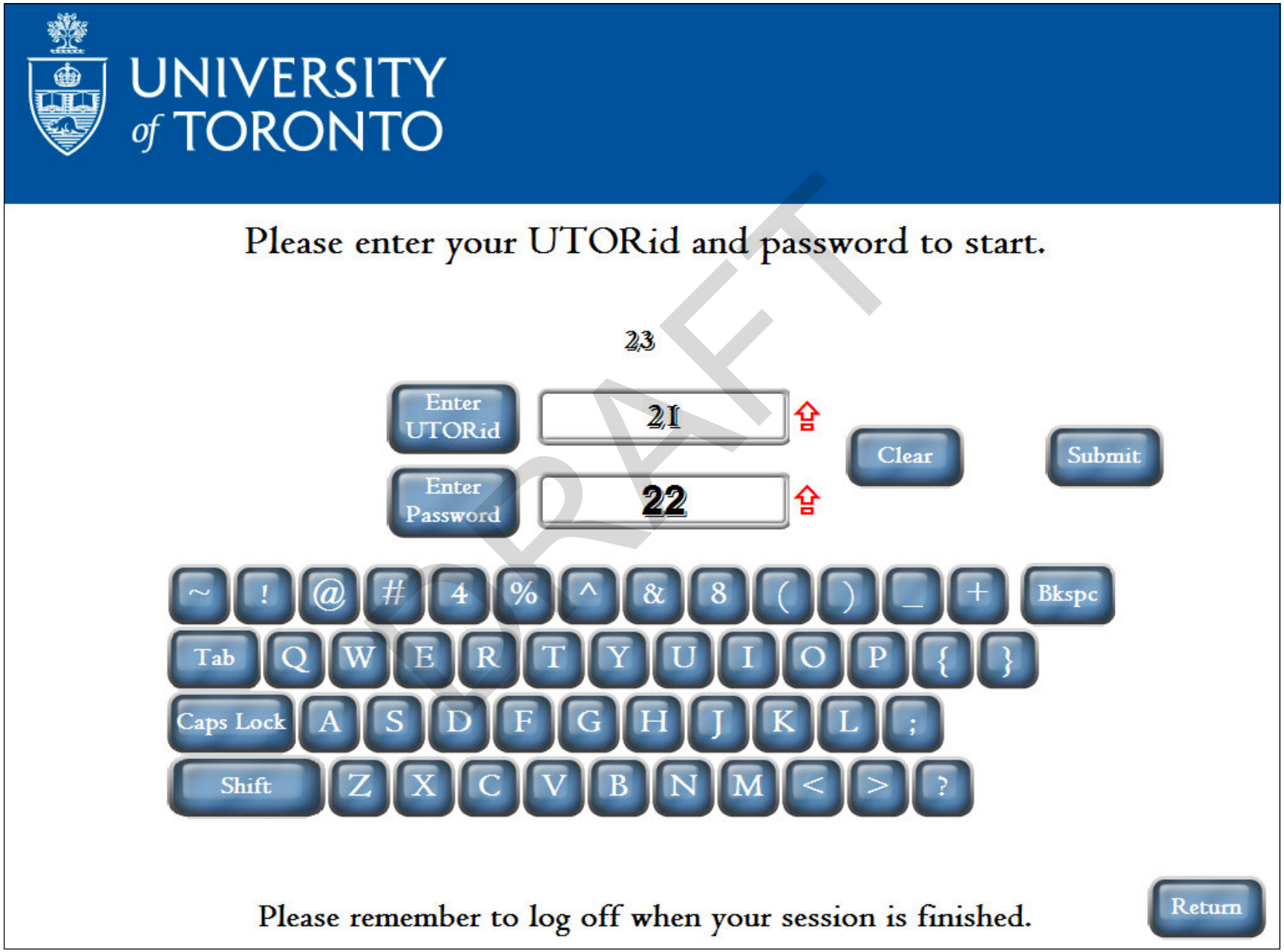
Drawn By	RS
Checked By	AC
Date	February 28, 2007
Scale	NTS

Revised

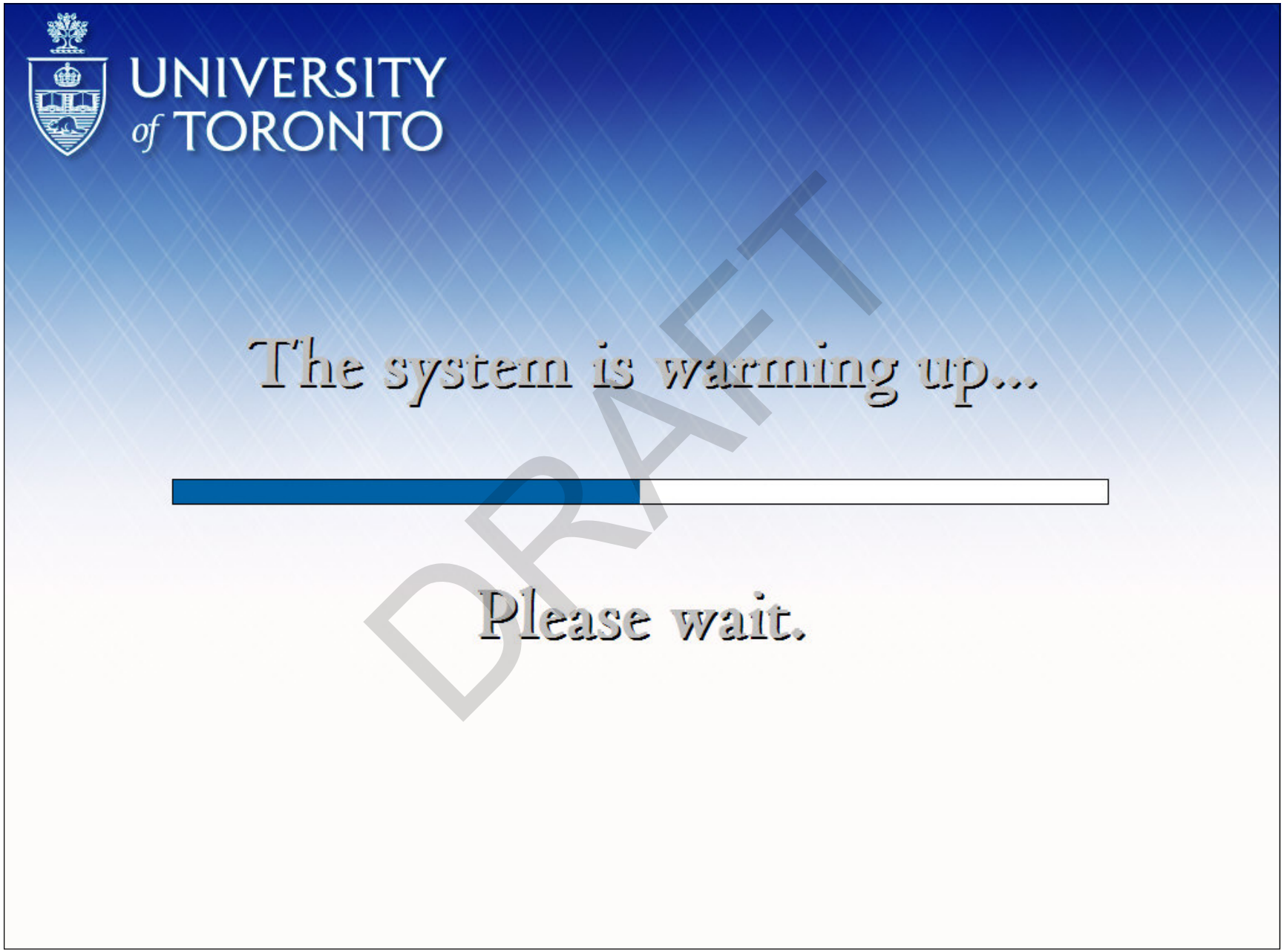
Drawing No.

Opening Screen

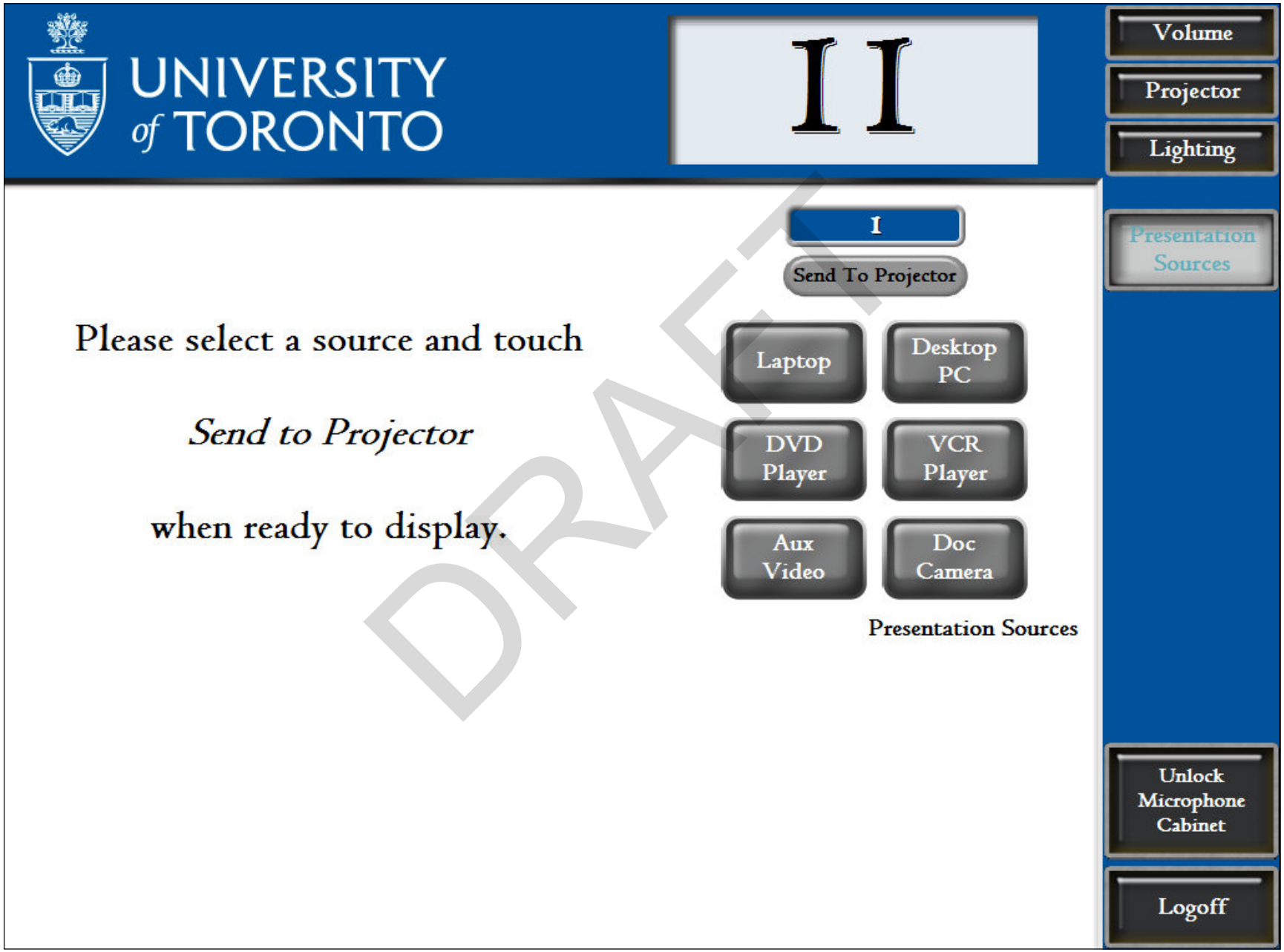
Login


UNIVERSITY of TORONTO
Please enter your UTORid and password to start.
23
Enter UTORid
21
Enter Password
22
Clear
Submit
~ ! @ # 4 % ^ & 8 ( ) _ + Bkspc
Tab Q W E R T Y U I O P { }
Caps Lock A S D F G H J K L ;
Shift Z X C V B N M < > ?
Please remember to log off when your session is finished.
Return
DRAFT

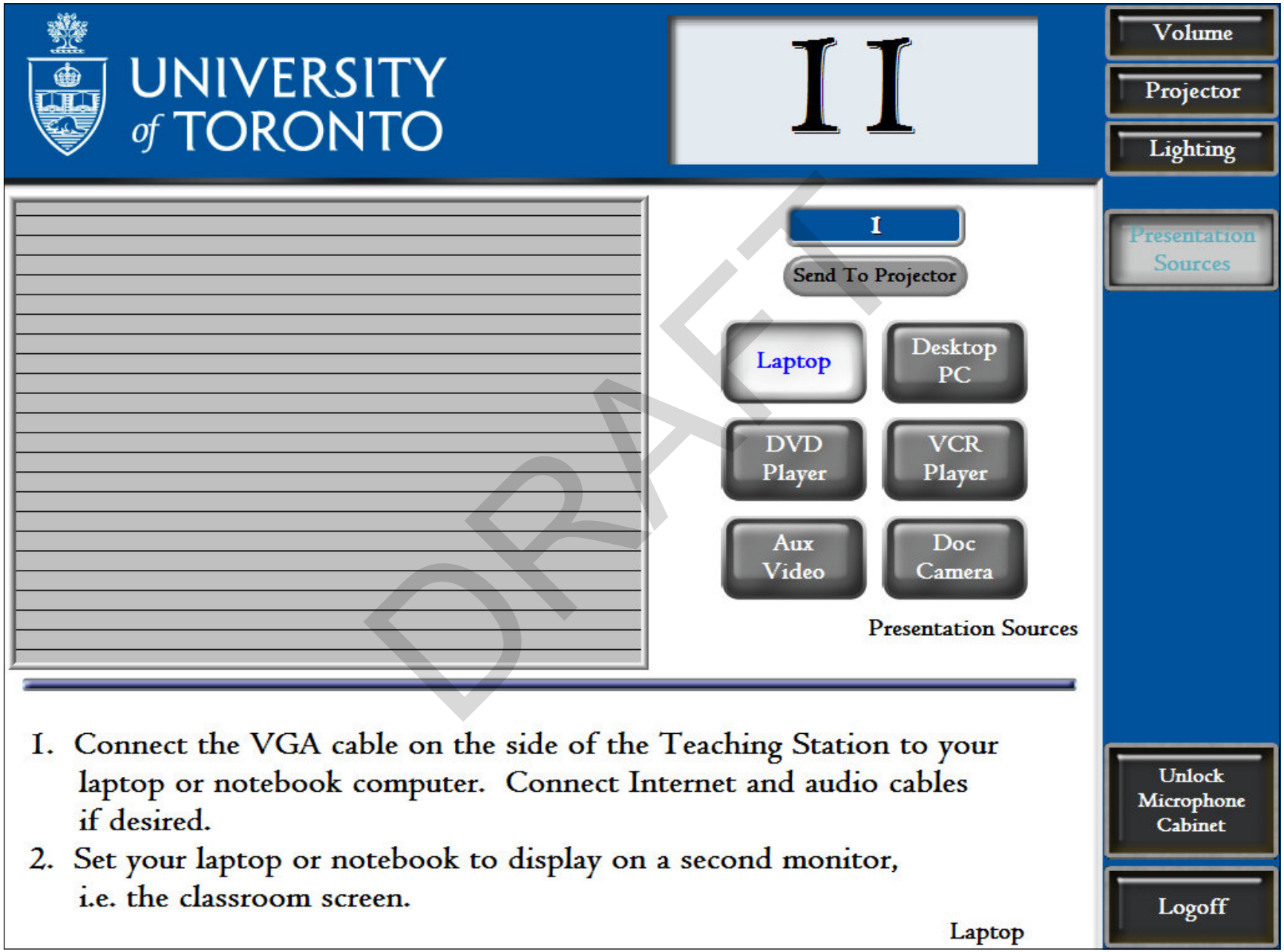
Warm-up


UNIVERSITY of TORONTO
The system is warming up...
Please wait.
DRAFT

Main Page


UNIVERSITY of TORONTO
II
Volume
Projector
Lighting
Presentation Sources
I
Send To Projector
Please select a source and touch
Send to Projector
when ready to display.
Laptop
Desktop PC
DVD Player
VCR Player
Aux Video
Doc Camera
Presentation Sources
Unlock Microphone Cabinet
Logoff
DRAFT

Laptop


UNIVERSITY of TORONTO
Volume
Projector
Lighting
Presentation Sources
Send To Projector
Laptop
Desktop PC
DVD Player
VCR Player
Aux Video
Doc Camera
Presentation Sources
1. Connect the VGA cable on the side of the Teaching Station to your laptop or notebook computer. Connect Internet and audio cables if desired.
2. Set your laptop or notebook to display on a second monitor, i.e. the classroom screen.
Laptop
Unlock Microphone Cabinet
Logoff
DRAFT

Electronic Classrooms at the University of Toronto

Appendix E: Teaching Station Components & Peripherals price list (OSM) Rev. 2/07 (RGBHV cabling)

Video Equipment		Price	
Main Screen	9' x 9'	$1,300	
Secondary screen	8' x 8'	$1,100	
Screen mounting Brackets		$50	
Low voltage switches and interface		$900	
Installation two men aprox 4hour @ 150./hr each		$1,200	
Electrical (Same as Above)		$600	
			$5,150
Podium			
Base Unit		$3,200	
Portable Lectern		$300	
Ethernet Intercom (Digital Acoustics)	ii3-MST	$300	
Door Station (AIPhone)	IE-JA	$66	
Aux Plate (Video and Audio Inputs ac)		$300	
Magnetic Locks for Podium		$600	
Reading Light		$75	
Podium wiring 15 hours one person @ $ 75.00		$1,125	
			$5,966
Video			
LCD projector Hitachi 1200 W with Lens Shift		$3,500	
Accessory Lens		$2,000	
Projector Cage and security Cable		$450	
DVD/VCR combo		$200	
Spare Lamp for lcd Projector		$600	
Twisted Pair Transmitter & Receiver for RGBHV	Vtr 001	$600	
Projection Scissor lift with installation		$8,500	
Eiki OH Projector dual Lamp	OHP 3870C	$300	
Cart for OH Projector		$150	
			$15,700
Control			
Crestron Control Processor MP2E		$1,400	
Crestron QM-TX Quick Media Transmitter	2	$1,440	
Crestron TPS-15G-QML		$6,600	
Crestron Volume controller card C2NVEQ4		$750	
Crestron Power Supply 75 watts	CNPWS-75	$400	
			$10,590
Audio			
1 Toa A-706MK2 Mixer power Stereo Amp	60 watts	$500	
Toa ceiling speakers Speakers		$700	
Shure Podium Gooseneck mic		$300	
Microphone Feedback Suppressor		$200	
Wireless Mic	add	$350	
			$2,050
Hearing Assistance			
Phonic Ear PE506T DDS Digital Transmitter		$800	
Phonic Ear PE506T DDS Digital Receiver 6 Channel	6 Pac	$1,065	
Phonic Ear AT-538-S Binaural Ear Buds	6 Units	$250	
			$2,115
Computer			
Dell GX620 Small Desktop		$759	
MS Office 2003		$86	
Symantec Ghost Suite 1.0		$15	
Deep Freeze Enterprise		$11	
Anti-Executable Enterprise		$29	
Norton Anti-virus		$0	
Remote Monitoring Capability		$150	
			$1,050
Miscellaneous			
Parts and Cables		$1,000	
Installation and room set up		$1,500	
Electrical installation		$3,000	
			$5,500
Optional			
Bench removal with asbestos, water, gas and/or electrical		$5,200	
Bench removal with water, gas and/or electrical		$2,700	
Bench removal basic (no utilities)		$600	
			$2,700
Total			$50,821

Electronic Classrooms at the University of Toronto

Appendix F:

OSM

St. George Installation Budget

BUILDING	ROOM	TYPE	ROOM_SIZE	Computer	Main Screen	Secondary Screen	LCD Projector	Podium	DVD/VHS	Audio	Hearing Assistance	Bench Removal (Simple)	Bench Removal (Complex-E)	Bench Removal (Complex-A)	Crestron Controls	Scissor Lift /Projector Safe	Electrical Installation	Room Totals
Bahen Centre Info Tech	BA 1130	Central	160	1050		N/A	4100	5666				600			8790	8500		$28,706
Bahen Centre Info Tech	BA 1160	Central	278	1050		2350	4100	5666				600			8790	8500		$31,056
Bahen Centre Info Tech	BA 1170	Central	130	1050		2350	4100	5666				600			8790	8500		$31,056
Bahen Centre Info Tech	BA 1180	Central	130	1050		N/A	4100	5666				600			8790	8500		$28,706
Bahen Centre Info Tech	BA 1190	Central	127	1050		N/A	4100	5666	200			600			8790	8500		$28,906
Banting Institute	BI 131	Central	198	1050	4050	2350	5150	5666	200	3000	2115	600			12607	8500	3000	$48,288
Claude T. Bissell Bldg	BL 205	Central	122	1050	4050	N/A	4700	5666	200		2115				12607	8500	3000	$41,888
Best Institute	CB 114	Central	101	1050	4050	2350	4100	5666	200		2115				12607	8500	3000	$43,638
Convocation Hall	CH	Central	1550	N/A			N/A	5666							8790			$14,456
Earth Sciences Centre	ES 1050	Central	400	1050	4050	2350	4100	5666			2115				8790			$28,121
Earth Sciences Centre	ES 142	Central	105	1050			4100	5666		1500	2115				12607		1500	$28,538
Earth Sciences Centre	ES 149	Central	100	1050			5150	5666	200	1500	2115				12607		1500	$29,788
Fitzgerald Building	FG 103	Central	197	1050		N/A	4100	5666			2115				8790			$21,721
Galbraith Building	GB 119	Central	104	1050			4100	5666			2115		2700		8790	8500		$32,921
Galbraith Building	GB 120	Central	104	1050	4050	2350	5150	5666	200	3000	2115		2700		12607	8500	3000	$50,388
Galbraith Building	GB 220	Central	102	1050	4050	2350	5150	5666	200	3000	2115		2700		12607	8500	3000	$50,388
Galbraith Building	GB 221	Central	102	1050	4050	2350	5150	5666	200	3000	2115		2700		12607	8500	3000	$50,388
Galbraith Building	GB 244	Central	102	1050	4050	2350	5150	5666	200	3000	2115		2700		12607	8500	3000	$50,388
Galbraith Building	GB 248	Central	103	1050	4050	2350	4100	5666	200		2115		2700		8790	8500		$39,521
Health Sciences	HS 610	Central	250	1050		N/A	6550	5666							8790			$22,056
Koffler Inst. Pharmacy Mgmt	KP 108	Central	182	1050		N/A	4700	5666	200		2115				12607	8500	1500	$36,338
Lash Miller Chemical Labs	LM 158	Central	98	1050			4100	5666			2115		2700		8790			$24,421
Lash Miller Chemical Labs	LM 159	Central	208	1050			5150	5666					2700		8790			$23,356
Lash Miller Chemical Labs	LM 161	Central	128	1050	4050		5150	5666	200	3000	2115		2700		12607	8500	3000	$48,038
Lash Miller Chemical Labs	LM 162	Central	154	1050	4050		5150	5666	200	3000	2115		2700		12607	8500	3000	$48,038
Mining Building	MB 128	Central	225	1050		2350	4700	5666	200		2115	600			12607	8500	3000	$40,788
Mechanical Engineering Bldg	MC 102	Central	350	1050		2350	6550	5666	200		2115	600			8790			$27,321
Mechanical Engineering Bldg	MC 252	Central	129	1050		N/A	4550	5666	200		2115		2700		8790			$25,071
Mechanical Engineering Bldg	MC 254	Central	128	1050	4050	N/A	5150	5666	200	3000	2115	600			12607	8500	3000	$45,938
McLennan Physical Labs	MP 102	Central	196	1050	4050		5150	5666	200		2115		2700		12607	2500	3000	$39,038

Electronic Classrooms at the University of Toronto

Appendix F:

OSM

St. George Installation Budget

BUILDING	ROOM	TYPE	ROOM_SIZE	Computer	Main Screen	Secondary Screen	LCD Projector	Podium	DVD/VHS	Audio	Hearing Assistance	Bench Removal (Simple)	Bench Removal (Complex-E)	Bench Removal (Complex-A)	Crestron Controls	Scissor Lift /Projector Safe	Electrical Installation	Room Totals
McLennan Physical Labs	MP 103	Central	196	1050	4050		5150	5666	200	3000	2115		2700		12607	2500	3000	$42,038
McLennan Physical Labs	MP 134	Central	93	1050			5150	5666			2115		2700		8790	8500		$33,971
McLennan Physical Labs	MP 137	Central	93	1050	4050		5150	5666	200	3000	2115			5200	12607	8500	3000	$50,538
McLennan Physical Labs	MP 202	Central	196	1050	4050		5150	5666	200		2115		2700		12607	2500	3000	$39,038
McLennan Physical Labs	MP 203	Central	196	1050	4050		5150	5666	200	3000	2115		2700		12607	2500	3000	$42,038
Medical Sciences Bldg	MS 2158	Central	500	1050	4050	N/A	6550	5666			2115				8790			$28,221
Medical Sciences Bldg	MS 2172	Central	140	1050	4050	2350	5150	5666	200		2115				8790	8500		$37,871
Medical Sciences Bldg	MS 2173	Central	109	1050	4050	2350	4100	5666	200	3000	2115				12607		3000	$38,138
Medical Sciences Bldg	MS 3153	Central	264	1050			5150	5666	200		2115				12607	8500	3000	$38,288
Medical Sciences Bldg	MS 3154	Central	288	1050			5150	5666	200		2115				12607	8500	3000	$38,288
Medical Sciences Bldg	MS 3163	Central	115	1050	4050	2350	4100	5666	200		2115				12607		3000	$35,138
Medical Sciences Bldg	MS 3171	Central	109	1050	4050	2350	4100	5666	200	1500	2115				12607		3000	$36,638
O.I.S.E.	OI G162	Central	500	1050	4050	2350	4550	5666			2115				8790			$28,571
Leslie Dan Pharmacy	PB B150	Central	300	1050			0	5666							8790			$15,506
Leslie Dan Pharmacy	PB B250	Central	240	1050			0	5666							8790			$15,506
Rosebrugh Building	RS 208	Central	85	1050		2350	4100	5666	200		2115	600			12607	8500	3000	$40,188
Rosebrugh Building	RS 211	Central	109	1050	4050	2350	5150	5666	200		2115	600			12607	2500	3000	$39,288
Ramsay Wright	RW 110	Central	156	1050	4050	N/A	4100	5666	200		2115				8790			$25,971
Ramsay Wright	RW 117	Central	156	1050	4050	N/A	4100	5666	200		2115	600			8790			$26,571
Sandford Fleming Bldg	SF 1101	Central	160	1050		2350	4700	5666	200	3000	2115	600			12607	8500	3000	$43,788
Sandford Fleming Bldg	SF 1105	Central	159	1050	4050	2350	4100	5666			2115		2700		8790			$30,821
Sidney Smith Hall	SS 1069	Central	108	1050	4050	N/A	4100	5666	200		2115				8790			$25,971
Sidney Smith Hall	SS 1073	Central	108	1050	4050	2350	5150	5666	200	3000	2115				12607		3000	$39,188
Sidney Smith Hall	SS 1085	Central	108	1050	4050	2350	5150	5666	200	3000	2115				12607		3000	$39,188
Sidney Smith Hall	SS 1087	Central	108	1050	4050	2350	5150	5666	200	3000	2115				12607		3000	$39,188
Sidney Smith Hall	SS 2102	Central	191	1050	4050	N/A	4100	5666			2115	600		5200	8790			$31,571
Sidney Smith Hall	SS 2117	Central	191	1050	4050	N/A	4100	5666	200		2115				8790			$25,971
Sidney Smith Hall	SS 2118	Central	190	1050	4050	N/A	5150	5666	200	3000	2115				12607	8500	3000	$45,338
Sidney Smith Hall	SS 2135	Central	188	1050	4050	N/A	5150	5666			2115				8790			$26,821

Electronic Classrooms at the University of Toronto

Appendix F:

OSM

St. George Installation Budget

BUILDING	ROOM	TYPE	ROOM_SIZE	Computer	Main Screen	Secondary Screen	LCD Projector	Podium	DVD/VHS	Audio	Hearing Assistance	Bench Removal (Simple)	Bench Removal (Complex-E)	Bench Removal (Complex-A)	Crestron Controls	Scissor Lift /Projector Safe	Electrical Installation	Room Totals
Tanz Neuroscience Bldg	TZ 6	Central	179	1050	4050	2350	5150	5666	200	3000	2115	600			12607	8500	3000	$48,288
University College	UC 140	Central	175	1050	4050	2350	5150	5666	200		2115				12607		3000	$36,188
University College	UC 161	Central	100	1050	4050	N/A	5150	5666	200	1500	2115				12607		3000	$35,338
University College	UC 179	Central	108	1050	4050	2350	4100	5666			2115				8790			$28,121
Wallberg Memorial Bldg	WB 116	Central	248	1050	4050	2350	6100	5666	200		2115		2700		8790	8500		$41,521
Wilson Hall	WI 1016	Central	163	1050		N/A	4100	5666			2115				8790			$21,721
Wilson Hall	WI 1017	Central	118	1050		N/A	4100	5666			2115				8790			$21,721
		Central Count																66
		Central Total (including taxes)																$2,528,100
Alumni Hall	AH 100	Feds	285	1050		N/A	4100	5666			2115				8790			$21,721
Alumni Hall	AH 400	Feds	198	1050	4050	**	5150	5666	200		2115				12607		3000	$33,838
Brennan Hall	BR 200	Feds	350	1050	4050	***	5150	5666	200		2115				12607	8500	3000	$42,338
Isabel Bader Theatre	BT 101	Feds	500	1050		N/A	7150	5666			IR				12607		3000	$29,473
Emmanuel College	EM 1	Feds	164	1050		2350	4100	5666			RF				12607		3000	$28,773
Emmanuel College	EM 119	Feds	180	1050	4050	2350	5150	5666	200	3000	2115				12607	8500	3000	$47,688
George Ignatieff Theatre	GI	Feds	181	1050	4050	2350	5150	5666	200		2115				12607	8500	3000	$44,688
Northrup Frye Hall	NF 3	Feds	308	1050		2350	4100	5666			2115				8790			$24,071
Victoria College	VC 323	Feds	140	1050		2350	4100	5666			2115				12607		3000	$30,888
		Feds Count																9
		Feds Total (including taxes)																$334,767
		Grand Count																75
		Grand Total (including taxes)																$2,862,867

*Location of LCD projector yet to be determined.
**Replace main screen and use current one as secondary screen
***Location for secondary screen will have to be investigated further
Note: Room Totals are net tax

Electronic Classrooms at the University of Toronto							
Appendix G: St. George Connection Budget (CNS)							
Location	***Closet***	***Cabling***	***Coring***	***Asbestos***	***Switch***	***Backbone***	***Total***
Bahen Centre 1130	BA1100	$1,000	$700		$2,500		$4,200
Bahen Centre 1160	BA1100	$1,000	$700				$1,700
Bahen Centre 1170	BA1100	$1,000	$700				$1,700
Bahen Centre 1180	BA1100	$1,000	$700				$1,700
Bahen Centre 1190	BA1100	$1,000	$700				$1,700
Banting Institute 131	BIb90A	$1,000	$700			$3,500	$5,200
Claude Bissell 205	BL211	$800	$700			$3,500	$5,000
Best 114	CB202	$1,000	$700		$2,500		$4,200
Convocation Hall - CH120	CH17	$500			$2,100		$2,600
Earth Sciences 142	ES148	$1,000	$700			$3,500	$5,200
Earth Sciences 149	ES148	$1,000	$700				$1,700
Earth Sciences1050	ES1046	$1,000	$700				$1,700
Fitzgerald 103	FG 137	$1,000	$700			$3,500	$5,200
Galbraith 119	GB 139	$800		$2,000	$2,500		$5,300
Galbraith 120	GB 139	$1,000	$700	$2,000			$3,700
Galbraith 220	GB216	$1,000	$700	$2,000			$3,700
Galbraith 221	GB216	$1,000	$700	$2,000			$3,700
Galbraith 244	GB216	$1,500	$700	$2,000			$4,200
Galbraith 248	GB216	$1,500	$700	$2,000			$4,200
Health Sciences 610	HSB570	$500	$700		$2,500		$3,700
Koffler Institute 108	KP	$1,500	$3,000			$3,500	$8,000
Lash Miller 158	LM129A	$1,000	$3,000			$3,500	$7,500
Lash Miller 159	LM129A	$1,000	$3,000				$4,000
Lash Miller 161	LM129A	$1,000	$3,000				$4,000
Lash Miller 162	LM129A	$1,000	$3,000				$4,000
Mining 128	MB129	$1,000	$700			$3,500	$5,200
Mechanical 102	MC53	$1,000				$3,500	$4,500
Mechanical 252	MC53	$1,500					$1,500
Mechanical 254	MC53	$1,500	$700				$2,200
McLennan 102	MP120	$1,000	$700				$1,700
McLennan 103	MP120	$1,000	$700				$1,700
McLennan 134	MP120	$1,000	$700			$3,500	$5,200
McLennan 137	MP120	$1,000	$700				$1,700
McLennan 202	MP120	$1,000	$700				$1,700
McLennan 203	MP120	$1,000	$700				$1,700
Medical Sciences 2158	MS2153	$500		$2,000	$2,500		$5,000
Medical Sciences 2172	MS2174	$1,000		$2,000	$2,500		$5,500
Medical Sciences 2173	MS2174	$1,000	$700	$2,000			$3,700
Medical Sciences 3153	MS3359A	$800	$700	$2,000		$3,500	$7,000
Medical Sciences 3154	MS3359A	$800	$700	$2,000			$3,500
Medical Sciences 3163	MS3359A	$1,000	$700	$2,000			$3,700
Medical Sciences 3171	MS3359A	$1,000	$700	$2,000			$3,700
OISE G62	Stage Rt.	$1,000	$700			$3,500	$5,200
Pharmacy Bldg - B150	LDb340	$1,000				$3,500	$4,500
Pharmacy Bldg - B250	LDb340	$1,000					$1,000
Ramsey Wright 110	RW212	$1,000	$700			$3,500	$5,200
Ramsey Wright 117	RW212	$1,000	$700				$1,700
Rosebrugh 208	RS311?	$1,500	$700				$2,200
Rosebrugh 211	RS311	$1,500	$700		$2,500		$4,700
Sanford Fleming 1101	SF1019	$1,000	$700			$3,500	$5,200
Sanford Fleming 1105	SF1019	$1,000	$700				$1,700
Sidney Smith 1069	SS2132	$1,000	$700	$4,000		$3,500	$9,200
Sidney Smith 1073	SS2132	$1,000	$700				$1,700
Sidney Smith 1085	SS2132	$1,000	$700				$1,700
Sidney Smith 1087	SS2132	$1,000	$700				$1,700
Sidney Smith 2102	SS2132	$1,000	$700	$4,000			$5,700
Sidney Smith 2117	SS2132	$1,000	$700				$1,700
Sidney Smith 2118	SS2132	$1,000	$700				$1,700
Sidney Smith 2135	SS2132	$1,000	$700				$1,700
Tanz 6	TZ5	$1,000	$3,000		$2,500		$6,500
University College 140	UC242	$1,000	$700			$3,500	$5,200
University College 161	UC59	$1,000	$700		$2,500		$4,200
University College 179	D06	$1,000	$700		$2,500		$4,200
Wallberg 116	WB124	$500				$3,500	$4,000
Wilson 1016	WI1028	$1,000	$700			$3,500	$5,200
WIlson 1017	WI1028	$1,000					$1,000
Central Subotal (66 rooms)		**$66,700**	**$53,000**	**$34,000**	**$27,100**	**$63,000**	**$243,800**
Contingencies (15%)		**$10,000**	**$8,000**	**$5,100**			**$23,100**
Authentication Servers							**$25,000**
UPS, Firewall, Backup Service							**$10,500**
Server Contingencies							**$13,500**
Central Total		**$76,700**	**$61,000**	**$39,100**	**$27,100**	**$63,000**	**$315,900**
Alumni Hall 100	AH 107	$1,500	$700			$3,500	$5,700
Alumni Hall 400	AH 107	$2,000	$700				$2,700
Brennan Hall	BR?	$4,500	$700		$2,700		$7,900
Isabel Bader Theatre	BT	$1,000	$700		$2,500		$4,200
Emmanuel 1	EM bsmnt	$1,000	$700	$2,000		$3,500	$7,200
Emmanuel 119	EM bsmnt	$1,000	$700	$2,000			$3,700
George Ignatieff	GI?	$3,000	$700			$3,500	$7,200
Northrop Frye 3	NF 2	$2,000	$700	$2,000	$2,500		$7,200
Victoria College 323	VCb12	$1,500	$700		$2,500		$4,700
Contingencies (15%)		**$2,600**	**$900**	**$900**			**$4,400**
Federated Total (9 rooms)		**$20,100**	**$7,200**	**$6,900**	**$10,200**	**$10,500**	**$54,900**

Electronic Classrooms at the University of Toronto
Appendix H: UTM Installation Budget (MicroElectronics, UTM) 25 Jan. 2007
Phase I (2007)

			Kaneff 137	CCT 1080	CCT 1140	North 292	South 2072	South 2074
Video Equipment		Price						
Main Screen	9' x 9'	$1,300					1300	1300
Secondary screen	8' x 8'	$1,100					1100	1100
Screen mounting Brackets		$50					50	50
Low voltage switches and interface		$900		Reposition screens *			900	900
Installation two men approx 4hour @ 150./hr each		$1,200		600	600		1200	1200
Electrical (Same as Above)		$600		600	600		600	600
Podium								
Base Unit		$3,200	3200	3200	3200	3200	3200	3200
Portable Lectern		$300	300	300	300	300	300	300
Ethernet Intercom (Digital Acoustics)	ii3-MST	$300	300	300	300	300	300	300
Door Station (AlPhone)	IE-JA	$66	66	66	66	66	66	66
Aux Plate (Video and Audio Inputs ac)		$300	300	300	300	300	300	300
Magnetic Locks for Podium		$600	600	600	600	600	600	600
Reading Light		$75	75	75	75	75	75	75
Podium wiring 15 hours one person © $ 75.00		$1,125	1125	1125	1125	1125	1125	1125
Video								
LCD projector Hitachi 1200 W with Lens Shift		$3,500	3500			3500		3500
Accessory Lens		$2,000	2000			2000		2000
Projector Cage and security Cable		$450	450			450	450	450
DVDNCR combo		$200	200	200	200	200		200
Spare Lamp for Icd Projector		$600	600	600	600		600	
Twisted Pair Transmitter & Receiver for RGBHV	Vtr 001	$600	600			600		600
Projection Scissor lift with installation		$8,500		8500	8500		8500	8500
Eiki OH Projector dual Lamp	OHP 3870C	$300	300	300	300	300	300	300
Cart for OH Projector		$150	150	150	150			150
Control								
Crestron Control Processor MP2E		$1,400	1400	1400	1400	1400	1400	1400
Crestron QM-TX Quick Media Transmitter	2	$1,440	1440	1440	1440	1440	1440	1440
Crestron TPS-15G-QML		$6,600	6600	6600	6600	6600	6600	6600
Crestron Volume controller card C2NVEQ4		$750	750	750	750	750	750	750
Crestron Power Supply 75 watts	CNPWS-75	$400	400	400	400	400	400	400
Audio								
1 Toa A-706MK2 Mixer power Stereo Amp	60 watts	$500	500				500	500
Toa ceiling speakers Speakers		$700	700					
Shure Podium Gooseneck mic		$300	300			300	300	300
Microphone Feedback Suppressor		$200	200	200	200		200	200
Wireless Mic	add	$350	350				350	350
Hearing Assistance								
Phonic Ear PE506T DDS Digital Transmitter		$800	800			800	800	800
Phonic Ear PE506T DDS Digital Receiver 6 Channel	6 Pac	$1,065	1065			1065	1065	1065
Phonic Ear AT-538-S Binaural Ear Buds	6 Units	$250	250			250	250	250
Computer								
Dell GX620 Small Desktop		$759	759	759	759	759	759	759
MS Office 2003		$86	86	86	86	86	86	86
Symantec Ghost Suite 1.0		$15	15	15	15	15	15	15
Deep Freeze Enterprise		$11	11	11	11	11	11	11
Anti-Executable Enterprise		$29	29	29	29	29	29	29
Norton Anti-virus		$0	0	0	0	0	0	0
Remote Monitoring Capability		$150	150	150	150	150	150	150
Miscellaneous								
Parts and Cables		$1,000	1000	1000	1000	1000	1000	1000
Installation and room set up		$1,500	1500	1500	1500	1500	1500	1500
Electrical installation		$3,000	3000	3000	3000	3000	3000	3000
Total per room			***$35,071***	***$34,256***	***$34,256***	***$32,571***	***$41,571***	***$47,421***

Sub Total	$225,146.00
GST	$13,508.76
PST	$18,011.68
Total	**$256,666.44**

Electronic Classrooms at the University of Toronto
Appendix H: UTM Installation Budget (MicroElectronics, UTM) 25 Jan. 2007
Phase 2 (2008)

UTM *(100+ capacity)*-Lectrure Room Costs

Complete room Installation estimate (Existing Cabling) 16-Oct

			North 134	North 205	North 287	South 2080	South 2082	South 3127
Video Equipment		Price						
Main Screen	9' x 9'	$1,300	1300	1300	1300	1300	1300	1300
Secondary screen	8' x 8'	$1,100	1100			1100	1100	
Screen mounting Brackets		$50	50	50	50	50	50	50
Low voltage switches and interface		$900	900	900	900	900	900	900
Installation two men approx 4hour @ 150./hr each		$1,200	1200	600	600	1200	1200	1200
Electrical (Same as Above)		$600	600	600	600	600	600	600
Podium								
Base Unit		$3,200	3200	3200	3200	3200	3200	3200
Portable lectern		$300	300	300	300	300	300	300
Ethernet Intercom (Digital Acoustics)	ii3-MST	$300	300	300	300	300	300	300
Door Station (AlPhone)	IE-JA	$66	66	66	66	66	66	66
Aux Plate (Video and Audio Inputs ac)		$300	300	300	300	300	300	300
Magnetic Locks for Podium		$600	600	600	600	600	600	600
Reading Light		$75	75	75	75	75	75	75
Podium wiring 15 hours one person © $ 75.00		$1,125	1125	1125	1125	1125	1125	1125
Video								
LCD projector Hitachi 1200 W with Lens Shift		$3,500	3500	3500	3500	3500	3500	
Accessory Lens		$2,000	2000	2000	2000	2000	2000	
Projector Cage and security Cable		$450	450	450	450	450	450	
DVDNCR combo		$200	200	200	200	200	200	
Spare Lamp for Icd Projector		$600						600
Twisted Pair Transmitter & Receiver for RGBHV	Vtr 001	$600	600	600	600	600	600	
Projection Scissor lift with installation		$8,500						
Eiki OH Projector dual Lamp	OHP 3870C	$300		300	300	300	300	300
Cart for OH Projector		$150				150	150	
Control								
Crestron Control Processor MP2E		$1,400	1400	1400	1400	1400	1400	1400
Crestron QM-TX Quick Media Transmitter	2	$1,440	1440	1440	1440	1440	1440	1440
Crestron TPS-15G-QML		$6,600	6600	6600	6600	6600	6600	6600
Crestron Volume controller card C2NVEQ4		$750	750	750	750	750	750	750
Crestron Power Supply 75 watts	CNPWS-75	$400	400	400	400	400	400	400
Audio								
1 Toa A-706MK2 Mixer power Stereo Amp	60 watts	$500				500	500	500
Toa ceiling speakers Speakers		$700						
Shure Podium Gooseneck mic		$300	300	300	300	300	300	300
Microphone Feedback Suppressor		$200		200		200	200	200
Wireless Mic	add	$350		350	350	350	350	350
Hearing Assistance								
Phonic Ear PE506T DDS Digital Transmitter		$800	800	800	800	800	800	800
Phonic Ear PE506T DDS Digital Receiver 6 Channel	6 Pac	$1,065	1065	1065	1065	1065	1065	1065
Phonic Ear AT-538-S Binaural Ear Buds	6 Units	$250	250	250	250	250	250	250
Computer								
Dell GX620 Small Desktop		$759	759	759	759	759	759	759
MS Office 2003		$86	86	86	86	86	86	86
Symantec Ghost Suite 1.0		$15	15	15	15	15	15	15
Deep Freeze Enterprise		$11	11	11	11	11	11	11
Anti-Executable Enterprise		$29	29	29	29	29	29	29
Norton Anti-virus		$0	0	0	0	0	0	0
Remote Monitoring Capability		$150	150	150	150	150	150	150
Miscellaneous								
Parts and Cables		$1,000	1000	1000	1000	1000	1000	1000
Installation and room set up		$1,500	1500	1500	1500	1500	1500	1500
Electrical installation		$3,000	3000	3000	3000	3000	3000	3000
Optional								
Bench removal basic (no utilities)		$600				600	600	
Total per room			***$37,421***	***$36,571***	***$36,371***	***$39,521***	***$39,521***	***$31,521***

Sub Total	$220,926.00
GST	$13,255.56
PST	$17,674.08
Total	**$251,855.64**

Electronic Classrooms at the University of Toronto

Appendix I: UTM Connection Budget (MicroElectronics, UTM)

UTM Estimate for Additional Cabling, Phase 1 (2007)

Class Room	Capacity	Podium System	Cost for Additional qty: 2 UTP Cabling cost	Switch cost
South 2072	258	5+ year old	$550.00	$2,500.00
South 2074	258	5+ year old	$550.00	
Kaneff 137	352	5+ year old	$550.00	
CCIT 1080	500	2+ year old	$550.00	
CCIT 1140	150	2+ year old	$550.00	
North 292	200	2+ year old	$550.00	
			$3,300.00	$2,500.00
		Total	$5,800.00	

GST	$464.00
PST	$348.00
Total	**$6,612.00**

UTM Estimate for Additional Cabling, Phase 2 (2008)

Class Room	Capacity	Podium System	Cost for Additional qty: 2 UTP Cabling cost	Switch cost
South 2080	164	5+ year old	$550.00	$2,500.00
South 2082	164	5+ year old	$550.00	
South 3127	102	2+ year old	$550.00	
North 134	160	2+ year old	$550.00	
North 205	115	2+ year old	$550.00	
North 287	113	2+ year old	$550.00	
			$3,300.00	$2,500.00
		Total	$5,800.00	

GST	$464.00
PST	$348.00
Total	**$6,612.00**

Appendix J

UTSC Installation and Connection Budget

Information and Instructional Technology Services

BUILDING	ROOM	ROOM-SIZE	COMPUTER	MAIN-SCREEN	SECONDARY-SCREEN	LCD PROJECTOR	PODIUM	DVD/ VHS	AUDIO	HEARING-ASSISTANCE	CRESTRON-CONTROLS	SCISSOR-LIFT	ELECTRICAL INSTALLATION	ROOM TOTALS
HUMANITIES	H 214	86	$1,050.00	$2,575.00	$2,575.00	$7,600.00	$5,966.00	$200.00	$2,400.00	$2,115.00	$10,590.00	$8,500.00	$5,500.00	$49,071.00
HUMANITIES	H215	86	$1,050.00	$2,575.00	$2,575.00	$7,600.00	$5,966.00	$200.00	$2,400.00	$2,115.00	$10,590.00	$8,500.00	$5,500.00	$49,071.00
SCIENCES	S128	135	$1,050.00	$2,575.00	$2,575.00	$7,600.00	$5,966.00	$200.00	$2,400.00	$2,115.00	$10,590.00	$8,500.00	$5,500.00	$49,071.00
SCIENCES	S143	135	$1,050.00	$2,575.00	$2,575.00	$7,600.00	$5,966.00	$200.00	$2,400.00	$2,115.00	$10,590.00	$8,500.00	$5,500.00	$49,071.00
MGMT	M170	120		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00		$10,590.00		$5,500.00	$31,440.00
ARC	AC223	500		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00	$2,115.00	$10,590.00		$5,500.00	$33,555.00
SCIENCES	S309	175		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00		$10,590.00	$8,500.00	$5,500.00	$39,940.00
SCIENCES	S319	175		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00		$10,590.00	$8,500.00	$5,500.00	$39,940.00
HUMANITIES	H216	240		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00		$10,590.00	$8,500.00	$5,500.00	$39,940.00
ARTS	A112	300		$2,575.00	$2,575.00	$7,600.00		$200.00	$2,400.00	$2,115.00	$10,590.00		$5,500.00	$33,555.00
Capital cost for servers & software														$9,900.00
													Total OTO	$424,554.00
Annual staff/support (per room, per year)							$2,721.00							$27,210.00
Annual maintenance (“Evergreen”) cost (Per room, per year to maintain equipment)							$3,400.00							$34,000.00
Annual maintenance for servers & software							$2,475.00							$2,475.00
													Total annual	$63,685.00