CSMLS
Canadian Society for Medical Laboratory Science

SCSLM
Société canadienne de science de laboratoire médical

Simulated Learning in Medical Laboratory Education: Current Perspectives and Practices

Phase 1 Report
April 2007

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Executive Summary

This report documents the Phase 1 activities and findings for the project "Simulated Learning in Medical Laboratory Education: Current Perspectives and Practices", being conducted by the Canadian Society for Medical Laboratory Science. This project is intended to create an evidence base and to identify any gaps in evidence for the use of simulated learning experiences in medical laboratory education in order to inform educational practices, policy- and decision-making processes, and potential directions for further research. This report outlines the data gathering activities (telephone/e-mail contacts and written surveys) undertaken as part of Phase 1 of the project, February to April 2007, and describes preliminary data gathered through the initial collation of survey responses.

Twenty-five medical laboratory program directors were contacted by e-mail to ascertain whether they use simulated laboratories as part of their curriculum. On the basis of the responses, surveys were mailed to the program directors to inquire further into their perspectives on and/or their experiences with simulated laboratories.

Participants' responses permitted a preliminary definitional categorization of simulated medical laboratory learning experience, for which the primary characteristic appears to be authenticity (i.e., the degree to which the simulated experience recreates the clinical laboratory environment). Elements of this authenticity include: workload and workflow, technology, task complexity, task breadth, and pedagogical strategies.

Full-time programs that make use of simulated laboratories generally schedule them after the students have had a major portion of their theoretical program and basic student laboratories, but before the students begin their clinical placement. Challenges with facilitating sufficient and appropriate learning experiences in clinical sites were the major factor prompting implementation of simulated learning, but respondents also cited advantageous educational benefits such as student confidence- and skill-building, orientation to the workplace environment, and the opportunity to evaluate student skills**.**

Most routine laboratory procedures have been incorporated into simulated laboratory activities. There is a need to expose students both to procedures that they will commonly encounter in laboratories as well as to those for which clinical experiences are not available. Respondents expressed doubts that certain types of laboratory experiences can be simulated, including the intensity of laboratory workflow, interprofessional interactions, certain types of specimens or automation, meaningful and authentic patient interactions, and appreciation of ethical issues of responsibility and confidentiality.

Survey participants stressed the resource-intensive nature of simulated laboratories. These are costly activities that require investments of space, equipment, supplies and time, and logistical scheduling. Most important are the demands placed on instructional and technical staff. Respondents relied upon industry-based professional expertise to establish their simulated laboratories and reported no meaningful support from published materials. Evaluation strategies to determine the effectiveness of simulated laboratories include employer and graduate satisfaction surveys; student satisfaction surveys; student performance in practical assessments,

examinations, and national certification examinations, and graduate employment uptake statistics.

Overall, the responses of students and instructors to simulated learning experiences are positive and there are efforts to expand these types of activities, provided that the necessary resources are made available. There appears to be a great deal of support for simulated laboratories in medical laboratory education as a means to enhance the clinical experience, but not to replace it entirely.

Six sites have been identified for Phase 2 site visits in May and June. These visits promise to allow further appreciation of implementation of simulated laboratories and a deeper analysis of the role of simulated learning in medical laboratory education.

Introduction

This report documents the Phase 1 activities and findings for the project "Simulated Learning in Medical Laboratory Education: Current Perspectives and Practices", being conducted by the Canadian Society for Medical Laboratory Science. Simulated learning activities are receiving a great deal of attention in medical laboratory educational programs, particularly since simulated laboratories are seen as a viable alternative to placement of students in clinical sites. However, there is little research on simulated learning in medical laboratory science, nor are there many resources to guide educators in the implementation of simulated laboratories.

This project is intended to create an evidence base and to identify any gaps in evidence for the use of simulated learning experiences in medical laboratory education in order to inform educational practices, policy- and decision-making processes, and potential directions for further research. Phase 1 data collection consists of telephone/e-mail contacts and written surveys between February and April 2007; and Phase 2 site visits and interviews study between May and September 2007. Participants in the study consist of medical laboratory program directors, instructors, students and graduates.

This report outlines the data gathering activities undertaken as part of Phase 1 of the project, describes preliminary data gathered through the initial analysis of survey responses, and indicates the next steps to be taken to initiate the Phase 2 data gathering and analysis process.

Phase 1 Project Activities

The goal of Phase 1 was to gather information from medical laboratory programs about perspectives on and implementation of simulated learning activities. A summary of these activities is found in Table 1, Phase 1 Objectives, Workplan and Activity Report.

A 2004 study of clinical placements within medical laboratory science programs provided preliminary information on the extent of simulated learning across the country.[1] This information was validated by e-mail correspondence with the 25 general medical laboratory programs.[2] A number of program directors reported having implemented simulated learning since the last data were collected. Two programs did not respond to these e-mail queries, despite repeated reminder messages asking for information. Appendix A outlines the contacts made with programs for these e-mail communications and for the subsequent mailed survey stage. Appendices B and C present the e-mail message templates in English and French.

[1] Grant, M. M. & Davis, K. H. (2004). *Clinical placements of Canadian medical laboratory technologists: Costs, benefits and alternatives.* Hamilton: Canadian Society for Medical Laboratory Science. http://www.csmls.org/english/pdf/annoncements/clinical-placements-report.pdf

[2] This study was confined to the 'general' medical laboratory programs (23 full-time and 2 'bridging'), which educate technologists in the five traditional laboratory disciplines, rather than including the specialty areas of cytogenetics and molecular diagnostics. It was felt that, since the general programs represent the majority of medical laboratory programs and graduate output, and since simulated learning appears to be less common among the specialty programs, this restriction would facilitate the generalizability of the resulting data.

Table 1
Simulated Learning in Medical Laboratory Education:
Current Perspectives and Practices
PHASE 1 OBJECTIVES, WORKPLAN and ACTIVITY REPORT

OBJECTIVE ONE: Preparatory work and initial survey data collection				
Activities	**Task & Resources (How, by Whom)**	**Time Frames**	**What do you expect to achieve? Indicators of Success**	**What did you achieve?**
Preparatory processes • Literature review • Telephone calls, e-mail messages to program directors • International queries • Development of surveys	Principal Researcher Consultant	February 2007	Development of initial survey instrument	Surveys were developed (4 versions) Program Directors were contacted to confirm prior information
Distribution of surveys	Principal Researcher Consultant CSMLS staff	February 2007	Distribution of survey tool	Survey mailed in March
Analysis of survey response data Clarification of unclear or missing data Preparation of Phase 1 report	Principal Researcher Consultant CSMLS staff	March 2007	Data submitted by all surveyed parties; will required telephone & e-mail follow-up	Data collated, some analysis; extensive follow-up necessary due to non-response of some participants
Submission of Phase 1 report	Principal researcher Consultant	March 2007	Identify detailed data collection sources Progress report on initial findings	Report submitted April 30 2007
Explanatory Comments and Challenges	The major challenge for this project has been eliciting responses from the programs. As indicated in the body of the report, six of the 25 programs contacted have not responded with completed surveys. Several have indicated a willingness to do so when time permits			

On the basis of the e-mailed responses, programs were divided into two categories: those that conduct simulated learning activities and those that do not. A survey was designed for each group, as this was thought to be the most efficient use of the participants' time and it permitted addressing specific targeted questions to the two groups which have very different experiences with simulated learning. Surveys directed to the 14 programs that reported use of simulations posed questions about implementation of and challenges to simulations, including specific queries about motivating factors, implementation strategies, evaluation measures, and the evidence-based decision-making that underpinned their program's adoption, design, application and evaluation of simulations (see Appendices D and E). For the 11 programs in the non-simulation group, the survey asked questions such as whether the program has plans to implement large-scale simulated learning in the future (Appendices F & F). Copies of both surveys were mailed to the two programs that did not reply to the initial e-mail survey, with instructions about selecting which survey to complete. Surveys and cover letters (Appendices H & I) were mailed to medical laboratory program directors in early March with postage paid envelopes addressed to the CSMLS.

To enhance response rates to the surveys, follow-up e-mail messages were sent and telephone calls were made to non-responders. One program director requested a telephone interview rather than a written survey. Appendix A outlines the contact schedules, strategies and outcomes.

Nineteen completed surveys were received by surface mail, facsimile, and e-mail. Field notes were made for the telephone interview. Six program directors have not responded with completed surveys, although two of these have indicated intentions to respond once their workloads ease in late April and early May.

The survey responses have been collated in text form (Appendix J). The data do not include institutional names as the survey respondents were assured in the survey cover letter that they and their institutions would not be identified by name.

Phase 1: Preliminary Data

This section presents a summary of the data gathered in Phase 1 but does not offer analysis or implications. Much remains to be learned in Phase 2 of this study about how medical laboratory programs implement simulated laboratory experiences and this addition perspective is needed before data analysis or implications can be considered.

Definitional Issues

A major goal for this study is establishing/uncovering a common definition for simulations in medical laboratory education. It is apparent that medical laboratory programs have offered simulations to some extent since they were first brought into the didactic environment in college-based programs: all courses have traditionally been accompanied by laboratory sessions in which students conduct analyses, like those performed in clinical laboratories, on 'doctored' or 'mock' specimens. Such laboratory sessions are typically limited in scope (one procedure at a time in one subject area at a time, such as chemistry or microbiology). The procedures may not

necessarily represent state-of-the-art technology, but are considered to impart the necessary foundations for theoretical understanding and manual skills. They may be considered ‘low level simulations’.

A number of characteristics of simulated laboratories were evident in respondents’ comments with respect to the newly-emerging simulated laboratory construct. Authenticity of the experience appears to be the major feature. With the exception of one program, these learning activities take place in the educational institution but recreate the environment and experiences of the clinical site. The characteristics of these simulated activities can be grouped into these categories:

- **Workload and workflow:** immersion in environments with large specimen volumes, workloads and work flow (in some cases, a full 8 hour work day); use of real patient specimens;
- **Technology:** use of current analytical technology and procedures: computers, phones, and, if possible, a laboratory information system;
- **Task complexity:** increasingly challenging tasks at a faster pace; introduction of work environment stressors such as distractions (for example, phone calls and other interruptions); recreations of authentic situations (such as priority and ‘stat’ testing); multi-tasking and troubleshooting;
- **Task breadth:** a continuum from specimen procurement, data entry, testing, resulting, reporting, many activities at same time; reagent preparation, instrument maintenance, troubleshooting, quality control, safety, interpretation and decision making; multi-disciplinarity (for example, a ‘core laboratory’ environment);
- **Pedagogical strategies:** experiential learning; problem-solving in a case-based environment to permit integration across laboratory disciplines; a focus on process rather than on product; high level of instructor supervision, interaction, and feedback; creation of a safe learning environment; situational responsiveness and flexibility (ability to alter pace, tailor tasks, provide individual attention); explicit application of theoretical concepts to bridge didactic (theoretical) and clinical (practical) elements of the curriculum.

These characteristics notwithstanding, it is not clear that all programs are interpreting the term ‘simulated laboratories’ in the same way, nor do all programs describe their simulations using all of the characteristics mentioned above. It is possible that, for some programs, ‘simulated laboratories’ are simply an extension or a re-naming of the low-level simulations that have traditionally been in use for the four to five decades that medical laboratory programs have operated within a college setting. This point will be investigated further in Phase 2 of the study.

Respondents reported that simulated laboratories are also known by these names: simulated clinical, simulated clinical practicum; teaching labs, student labs, simulated clinical experience, simulated Canadian experience; performance activities; *situation problème finale*; *apprentissage simulé*.

There appear to be two main categories of programs using simulated laboratories: those that have used simulations since the 1960s and 1970s (most likely since the inception of the program) and

those that have adopted simulated laboratories only recently (i.e., since 2000). Further study in Phase 2 may reveal differences in the simulated laboratory experiences in these two cases that are not apparent at this initial level of discussion.

Implementation Characteristics of Simulated Laboratories

Scheduling in the school year

Full-time programs that make use of simulated laboratories generally schedule them after the students have had a major portion of their theoretical program and basic student laboratories but before the students begin their clinical placement. Simulated laboratories may take the place of a clinical placement. Block scheduling (for example, for a period of six to ten weeks) is common. One program reported 669 hours of simulated laboratories in 22 weeks. Another offers a couple of lectures in the morning, and then laboratories for the rest of the day. Still another noted that simulated labs constitute 60% of the program time. In the one instance of simulation in the clinical setting, simulated activities are offered on an 'on call' basis; i.e., when preceptors are so busy with laboratory work that they are unable to supervise their students. In this case, simulated activities are set up so that the students are occupied with technical work while they wait for their preceptor to resume teaching duties. One bridging program for internationally-educated MLTs offers flexible scheduling tailored to the needs of the students.

Reasons for using simulations

Respondents provided a number of reasons that simulated laboratories are being used in their programs. In addition to historical precedent, they reported using simulated laboratories in order to:

- compensate for a short practicum;
- address the shortage of clinical placements by lessening the amount of time needed at clinical institution and permitting placement of increased numbers of students;
- increase student skills to a standard acceptable for clinical site and thus to ease the work of preceptors;
- facilitate the scheduling of clinical placements;
- expose students to situation/cases that may not occur during their clinical placement;
- provide an alternative for experiences for which clinical experience is increasingly difficult to arrange (i.e., histology, microbiology, transfusion science);
- orient students to real world expectations and practices prior to their clinical placement;
- permit students to develop basic time and resource management skills;
- reinforce theory and integrate it with practice;
- increase student confidence;
- permit students to identify their strong points, address their weak points, and to make mistakes in a 'safe' environment;
- provide orientation to Canadian health care practices and environments for internationally-educated medical laboratory technologists;
- establish consistency in learning experience from one student to the next;
- provide opportunities to evaluate students' practical skills.

Challenges with clinical placements were mentioned most frequently as motivating factors for implementation of simulated laboratories.

Choice of simulated activities

Most routine laboratory procedures have been adapted to simulated laboratory use. A full list is provided in Appendix L. Other activities include lectures and seminars on special topics and student evaluation (written and practical).

Survey respondents reported instructor-to-student ratios anywhere from 1:2 (for situations where student safety issues are a major concern) to 1:10. In several cases, teaching assistants or educational technologists are available in addition to the primary laboratory instructors.

Factors that go into selecting activities to be simulated include:

- complementarity of didactic/clinical: programs will seek to simulate activities that cannot be carried out in the clinical site;
- commonality: routine procedures and relevance to all clinical sites;
- priorities arising within the program's competency based objectives;
- activities that need time for students to practice;
- availability of equipment; samples; supplies; space; support & education for staff
- validity of the learning experience: its potential for authenticity; the likelihood of minimal compromise to quality of the student experience; evidence of effectiveness relative to effort and cost involved.

Several respondents commented that anything could be simulated if the appropriate resources were available. However, there were some elements about which respondents consistently expressed doubts. These include:

- the intensity of laboratory workflow: the sense of urgency, distractions, workplace stressors;
- interprofessional interactions;
- authentic products for transfusion science;
- certain types of specimens (for example, some microbiological or unstable specimens);
- some high-tech applications (due to cost);
- relevant breadth of instrumentation and samples;
- extensive/meaningful patient contact;
- awareness of the consequences of one's actions when performing testing on real patient samples;
- appreciation of confidentiality issues.

Resource Requirements

It was apparent from respondents' comments that simulated laboratories are resource-intensive. In effect, educational institutions are attempting to re-create a hospital laboratory at the

educational site. One respondent noted that the program's simulated laboratories were "the most expensive part of the program". Important considerations noted in the surveys include

- staffing (preparation is demanding, supervision is intensive);
- time;
- equipment and reagents;
- funding;
- space (dedicated space is preferred; without it, scheduling difficulties arise);
- scheduling logistics are considerable to avoid conflicts with other parts of the program and other programs that may use the facilities; simulated labs may be offered on weekends or in summers; simulated labs place constraints on other program offerings;
- program length and structure (some programs cannot accommodate simulated laboratories in their curricula);
- sample provision by clinical partners (issues of ethics, privacy, and transportation).

Models/guidelines/resources

Respondents noted that existing practitioner- and program- based expertise is the most widely-utilized source of guidance and information for implementing simulated laboratories. To prepare for and support their simulated laboratories, participants reported consulting competency based objective documents as well as other programs that are already using simulations. They noted that the recent industry experience of those involved in simulated laboratory setup and the involvement of their clinical partners were particularly crucial to the success of their simulated laboratory projects. The lack of documented, pedagogically validated support material is marked. Only one published resource was identified, and this document merely offers support for the use of simulations in several professions without providing any guidelines for their implementation.[3]

Costs of simulations

Only one respondent offered specific information related to cost, noting that a recently-submitted proposal for simulated laboratory experiences in her program included a projected cost of $800,000 for 8 weeks of simulated laboratory activities. All respondents acknowledged the immensely costly nature of simulated laboratories. In one case, a survey participant reflected that simulated laboratories lose money, and that it is not possible to recover the costs by charging students. Another participant stated that it is more expensive to run simulated laboratories than to send students out to a clinical site for the same length of time.

Further information on costs of simulations will be gathered in Phase 2 of the study.

Unexpected outcomes

Staff burnout was mentioned by several respondents. They noted that the work involved in preparing and implementing simulated laboratories was far greater than anticipated.

[3] Herbst, D. H., Morris, S., Fort, J., Schneider, L., Veitenheimer, K., & Deane, S. (2006). Identifying best practices for clinical practice education. Ottawa: Health Canada.

Evaluating the effectiveness of simulated laboratories

Respondents reported the following strategies for evaluating their simulated laboratory experiences:

- employer satisfaction surveys;
- student surveys;
- graduate satisfaction surveys;
- student success on CSMLS certification examinations;
- student practical assessments and theoretical exams;
- comments from preceptors and clinical instructors;
- graduate employment uptake statistics.

One respondent also noted an increased receptivity of employers to taking students from simulated courses which she felt reflected positively on the simulated laboratory program.

Respondents reported a mainly positive response from students who participated in simulated laboratories, although one respondent noted that students have difficulty viewing the simulated laboratories as 'real'. Students express a high level of satisfaction with simulated laboratories and look forward to the opportunity. They appreciate being able to make mistakes there rather than in a real hospital in front of a potential employer; they find the simulated experience to be good preparation for the real laboratory world and value the consistency of this learning environment.

According to survey participants, instructors who teach in simulated laboratories also regard the learning experiences as mainly beneficial, and felt they were valuable opportunities for instructors to offer an integrated case-based perspective as well as to identify weaknesses in students' skills and to institute remedial action. However, instructors expressed concerns about the time and energy involved, and their inabilities to adequately address student needs during the simulated laboratory session due to insufficient numbers of instructional staff.

Survey participants reflected that, based on their experiences with simulated laboratories, they would like to see more resources provided for implementing the experiences, including instrumentation, staff, budget, and time. They also felt that it would be valuable to introduce opportunities for interprofessional interactions. One respondent expressed a wish for more time for simulated laboratories, while another felt there should be less simulation and more time spent in the clinical environment.

To conclude this section, the support for simulated laboratories is generally positive, although there is a clear assumption that the purpose of simulated laboratories is to *enhance* clinical experience, and not to replace it. Participants whose programs do not have simulated laboratories in place expressed slightly more skepticism about the value of simulated laboratories than did others. For example, one respondent noted,

> "We are not interested in developing more simulated labs. It's not a question of resources. It's a matter of the quality of training. Our clinical sites train our students better than we could ever accomplish in a simulated lab."

In general, programs that currently run simulated laboratories are hoping to extend or expand them, while most of the programs that do not use them at present have plans in various stages of development and/or approval.

Phase 1 Expenditures

Expenses for Phase 1 have involved principal investigator time, translation services, and the survey production and mailing costs (letterhead; printing; manila envelopes, postage paid return envelopes, postage). Details will be provided in the Financial Report that accompanies this Phase 1 report.

Next Steps: Phase 2

Six sites have been identified for follow-up visits to facilitate further inquiry into their use of simulated laboratories, and have agreed to host tours of laboratory facilities and interviews with instructors, students and former students, In order to accommodate school calendars and instructor schedules, these visits are being scheduled for the second half of May and the month of June. Two institutions have already agreed on dates for the site visits.

New Brunswick Community College, Saint John, New Brunswick (May 22 & 23, 2007)
College of the North Atlantic; St. John's, Newfoundland (May 24 & 25 2007)
Mohawk College Bridging Program; Hamilton, Ontario (To be arranged)
The Michener Institute for Applied Health Sciences; Toronto, Ontario (To be arranged)
Northern Alberta Institute of Technology; Edmonton, Alberta (To be arranged)
University of Alberta; Edmonton, Alberta (To be arranged)

Among the topics/strategies to be addressed in detail during the site visits are:

- Interviews with program director, instructors, students, former students, employers
- Resource implications: space utilization (floor plans); scheduling; staffing; equipment and reagents; overall costs;
- Effectiveness: instructors', students', and employer's perceptions of workplace readiness as a result of simulated laboratory experiences.

In addition, program directors for programs not being visited will be contacted by telephone to delve into the previously-mentioned issue of distinguishing 'low-level' from 'high-level' simulation in their programs.

Conclusion

Phase 1 of the study on simulations in medical laboratory programs has provided the foundations for an informed and relevant definition of simulated laboratory learning in the professional preparation of medical laboratory technologists. It has also highlighted a number of commonalities in implementation of these learning experiences and sets the stage for Phase 2's deeper inquiry into the use and implications of simulated laboratories in medical laboratory education.

Appendices

Appendix A – Phase 1 contact record sheet
(overleaf)

PHASE 1 CONTACT RECORD SHEET – April 18 2007

CONTACT INFO	E-MAIL DATE	SURVEY	SURVEY MAILED	SURVEY REC'D	NOTES
Dr. Jennifer McPhee, Program Coordinator Medical Laboratory Science Program B-117 Clinical Sciences University of Alberta Edmonton Alberta Canada T6G 2G3 jmcphee@ualberta.ca Phone: (780) 492-6601 Fax: (780) 492-7794	Feb 13 2007	S1	March 1 2007	**YES**	
Margaret Clifford, Program Coordinator Medical Laboratory Technology New Brunswick Community College P.O. Box 2270 950 Grandview Avenue Saint John, NB E2L 3V1 margaret.clifford@gnb.ca Phone: (506) 658-6675 Fax: (506) 643-2853	Feb 13 2007	S1	March 1 2007	**YES**	
Karen Kennedy Dean, Health Sciences College of the North Atlantic One Prince Philip Drive PO Box 1693 St. John's, NL A1C 5P7 karen.kennedy@cna.nl.ca Phone: (709) 758-7624 Fax: (709) 758-7634	Feb 13 2007	S1	March 1 2007	**YES**	Response received from Robin Power
Mary Golba-Bylhouwer Mohawk-McMaster Institute for Applied Health Sciences 1400 Main Street West Hamilton, ON L8S 1C7 mary.golba-bylhouwer@mohawkcollege.ca	Feb 13 2007	S1	March 1 2007	**YES**	Bridging program
Kelly Geddes, Program Coordinator Access and Options Program The Michener Institute 222 St. Patrick Street Toronto ON M5T 1V4 ACCESS@michener.ca	Feb 13 2007	S1	March 1 2007	**YES**	Bridging program Reminder e-mail: March 27 2007 Conducted phone interview with Ellen Moyo, April 13 2007. EM agreed to convey contact information to K. McPherson for follow-up with more technically-oriented questions

Ms. Suzanne Allaire, Program Coordinator, Medical Laboratory Program The Michener Institute 222 St. Patrick Street Toronto ON M5T 1V4 Phone: (416) 596-3138 Fax: (416) 596-3168 sallaire@michener.ca	Feb 13 2007	S1	March 1 2007	**YES**	
Ms. Gillian Rimmer, Program Coordinator Medical Laboratory Program Red River College 2055 Notre Dame Ave. Winnipeg MB R3H 0J9 grimmer@rrc.mb.ca Phone: (204) 632-2009 Fax: (204) 632-4859	Feb 13 2007 Feb 26 2007	S1	March 1 2007		Reminder e-mail: March 27 2007 No responses or acknowledgements
Ms. Sue Hemmerling, Program Coordinator Medical Laboratory Program Cambrian College 1400 Barrydowne Road Sudbury ON P3A 3V8 Phone: (705) 566-8101 ext 7223 Fax: (705) 524-8469 smhemmerling@cambrianc.on.ca	Feb 13 2007	S1	March 1 2007		Reminder e-mail: March 27 2007 SH responded that she will submit responses shortly (March 27 2007) Still hoping to submit (April 18 2007)
Ms. Aleatha Schoonover, Program Head Medical Laboratory Program SIAST – Kelsey Campus Idylwyld & 33rd St. Saskatoon SK S7K 3R5 Phone: (306) 933-6202 Fax: (306) 933-7018 schoonover@siast.sk.ca	Feb 13 2007 Feb 26 2007 March 5 2007	S1	March 12 2007	**YES**	No response as of March 5/07 Received phone message March 8 2007 I returned the call March 9 2007 a.m. Spoke with AS on Monday 12 2007. Received survey responses from Laureen Millette
M. Joël Gagné, Coordonnateur Programme TAB Cegep de Rosemont 6400 – 16ieme av Montreal QC H1X 2S9 Téléphone**:** (514) 376-1620 poste 447 Télécopieur**:** (514) 376-3211 jgagne@crosemont.qc.ca	Feb 19 2007	S1 - F	March 9 2007	**YES**	Reminder e-mail: April 2 2007 Not able to respond due to current workload Hopes to respond after May 1 (April 2 2007)

Mme Guylaine Michaud Enseignante titulaire CCNB-Campbellton 330 av Université Moncton NB E1C 2Z3 Téléphone: (506) 862-4478 Télécopieur: (506) 869-6295 guylainem@health.nb.ca	Feb 19 2007	S1 - F	March 9 2007		Reminder e-mail April 2 2007 No acknowledgements
Mme Nathalie Lapointe, Directrice Programme TAB Cegep de Chicoutimi 534 Rue Jacques-Cartier est Chicoutimi QC G7H 1Z6 nlapoint@cegep-chicoutimi.qc.ca Téléphone : (418) 549-9520 poste 493 Télécopieur: (418) 549-7930	Feb 19 2007	S1 - F	March 9 2007	**YES**	New program director
Madame Hélene Lord-Dubé, Coordonnatrice Cegep Sainte-Foy 2410 Chemin Sainte-Foy Quebec QC G1V 1T3 hlorddube@cegep-ste-foy.qc.ca (418) 659-6600 poste 6750 (418) 659-4563	Feb 19 2007 (HLD) Feb 26 2007 (HLD, NB) March 5 2007 (NB)	S1-F	March 9 2007		No response as of March 5/07. Messages originally sent to Hélene Lord-Dubé; returned 'unknown'. Web site lists N Bergeron as contact person for TAB programme (no response from NB). HLD responded on March 6 2007 with a query. Responded 'yes' on March 8 2007. Reminder e-mail April 2. HLD asked for more time (April 2 2007)
Ms. Colleen Gibson, Program Leader Medical Laboratory Program, BCIT 3700 Willingdon Ave. Burnaby BC V5G 3H2 Phone: (604) 432-8831 Fax: (604) 432-1816 colleen_gibson@bcit.ca	Feb 13 2007	S2	Hand delivered March 2 2007	**YES**	Responded that BCIT program for international students does not use simulations Reminder e-mail: March 27 2007 Responded that she has turned survey over to clinical coordinator Anne Murray (March 27) Received April 2, 2007
Ms. Jan Fox, Program Coordinator Medical Laboratory Program St. Lawrence College King St. & Portsmouth Ave. Kingston ON M7L 5A6 Phone: (613) 544-5400, ext.1206 Fax: (613) 545-3915 jfox@sl.on.ca	Feb 13 2007	S2	March 1 2007	**YES**	Reminder e-mail: March 27 2007 Returned survey responses March 28

Ms. Karen Gabriele, Chairperson Medical Laboratory Program Dawson College 3040 Sherbrooke St. W. Westmount QC H3Z 1A4 Phone: (514) 931-8731 Fax: (514) 931-3567 kgabriele@dawsoncollege.qc.ca	Feb 13 2007	S2	March 1 2007	**YES**	
Mme Marie Rousseau, Coordonnatrice Programme TAB Cegep de St-Jean-sur-Richelieu 30 boul du Seminaire, CP 1018 St-Jean-sur-Richelieu QC J3B 7B1 Téléphone: (450) 347-5301 poste 2225 Télécopieur: (450) 347-3329 marie.rousseau@cstjean.qc.ca	Feb 19 2007	S2 - F	March 9 2007	**YES**	Reminder e-mail April 2 2007
Ms. Jan Maxwell Coordinator, MLS Program St. Clair College of Applied Arts and Technology 2000 Talbot Rd. W. Windsor ON N9A 6S4 Phone: (519) 972-2727, x4442 Fax: (519) 972-0801 jmaxwell@stclaircollege.ca	Feb 13 2007	S2	March 1 2007	**YES**	
Ms. Kimberly Wheelans Program Team Leader Medical Laboratory Program SAIT 1301 16 Ave. NW Calgary AB T2M 0L4 Phone: (403) 284-8483 Fax: (403) 284-8171 kimberly.wheelans@sait.ab.ca	Feb 13 2007 Feb 26 2007	S2	March 1 2007	**YES**	First message sent to S. Chamberlin. Second message sent to K. Wheelans. K. Wheelans completed survey
Mme Karine Whittey, Coordonnatrice Programme TAB Cegep de Saint-Hyacinthe 3000 rue Boullé CP 9000 Saint-Hyacinthe QC J2S 1H9 kwhitty@cegepsth.qc.ca	Feb 19 2007	S2 - F	March 9 2007	**YES**	Coordonnatrice nouvelle

Mme Céline Desjardins, Coordonnatrice Programme TAB Cegep de Saint Jérôme 455 Rue Fournier Saint-Jérôme QC J7Z 4V2 Téléphone**:** (450) 436-1580 poste 234 Télécopieur**:** (450) 436-1756 cdesjard@cstj.net	Feb 19 2007	S2 - F	March 9 2007		Reminder e-mail April 2 2007 No acknowledgements Contacted by F. Lanciault-Lun (CSMLS Director); responded to MG with request for more information about simulations
M. Bernard Émond, Coordonnateur Programme TAB Cegep de Rimouski 60 Rue Évêche ouest Rimouski QC G5L 4H6 Téléphone: (418) 723-1880 poste 2319 Télécopieur: (418) 724-4961 tab-hematologie@cegep-rimouski.qc.ca	Feb 19 2007 Feb 26 2007 March 5 2007	S2-F	March 9 2007	**YES**	No response as of March 5/07 Responded with a query on March 6/07 Responded with a 'no simulations' on March 7/07 Reminder e-mail April 2 2007
Ms. Heather Gray, Program Leader Medical Laboratory Program NAIT 11762-106 Street Edmonton AB T5G 2R1 Phone: (780) 471-7649 Fax: (780) 471-8902 heatherg@nait.ca	Feb 13 2007	S1, S2	March 1 2007	**YES (2)**	Agreed to respond for both full-time and former accelerated programs. Has offered to forward Health Canada evaluation report on latter program
Mme Anne Rousseau, Coordonnatrice Programme TAB Cegep de Sherbrooke 475 rue du Parc Sherbrooke QC J1H 5M7 Téléphone**:** (819) 564-6350 poste 6026 Télécopieur**:** (819) 564-4025 roussean@collegesherbrooke.qc.ca	Feb 19 2007 Feb 26 2007 March 5 2007 March 9 2007	S1, S2	March 12 2007		No response to e-mail query as of March 5/07. E-mail messages returned as 'unknown' or 'invalid'. Messages sent to other instructors in the department also returned with same error messages. Message also sent to Jean Royer (l'aide pedagogique du programme, jean.royer@cegepsherbrooke.qc.ca). Two telephone messages not returned. Package sent to AR with both surveys and instructions to use the appropriate one. E-mail response to initial inquiry received March 28 from J-F Lachance. Jean-Francois.Lachance@cegepsherbrooke.qc.ca Responded with e-mail notification of mailed survey and a request to respond. Reminder e-mail No response

Appendix B – e-mail message template, English

SUBJECT: CSMLS Study on Simulations: response requested by February 20

Dear ,

The CSMLS is conducting a study on the use of simulated learning experiences in medical laboratory science programs. The study is funded by Health Canada and promises to create a shared information resource for our programs as well as a better understanding of how MLS programs implement simulated learning. Your input is very important!

Before implementing the main part of the study, we would like to determine whether your program makes use of simulated learning experiences. Your response to this query determines the nature of the follow-up inquiry we will send to you in several weeks.

Thank you for your assistance with our study! We would appreciate receiving your response by February 20.

Moira M. Grant, PhD MLT ART
Director of Research
Canadian Society for Medical Laboratory Science

T: 905-528-8642 ext. 35
F: 905-528-4968
www.csmls.org

Excellence in medical laboratory science

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Appendix C – e-mail message template, French

SUJET: Étude de la SCSLM sur les simulations; réponse demandée pour le 5 mars

Monsieur/Madame ,

La SCSLM effectue une étude sur l'utilisation des expériences d'apprentissage simulées dans les programmes de science de laboratoire. L'étude est subventionnée par Santé Canada et vise à élaborer des ressources d'information pour nos programmes tout en offrant une meilleure compréhension de la raison qui motive l'implantation de l'apprentissage simulé. Vos commentaires sont très importants pour nous.

Avant de mettre en vigueur la partie principale de l'étude, nous souhaitons confirmer l'information que nous avons sur votre programme. En réponse à une étude effectuée en 2004 par la SCSLM sur les stages cliniques, vous (ou un porte-parole de votre programme) avez indiqué que votre programme avait expérimenté d'épreuves de laboratoire simulées.

Est-ce bien le cas? Un simple 'oui' ou 'non' suffira pour répondre à ce message et nous ferons le suivi avec une demande plus élaborée dans plusieurs semaines.

Je vous remercie de votre participation à notre étude! Une réponse avant le 5 mars serait fort appréciée.

Moira Grant, Ph.D., MLT, ART
Directrice de la recherche
Société canadienne de science de laboratoire médical

Téléphone : 905-528-8642, poste 35
Télécopieur : 905-528-4968
www.scslm.org

Cliquez ici pour afficher la déclaration de la SCSLM sur la confidentialité

Appendix D – Cover letter template, English

February 26 2007

Name, Title
Program
Institution Name
Address
Address

Dear Name,

As you are aware, the CSMLS is conducting a study, funded by Health Canada, on the use of simulated learning in medical laboratory education. There is a very large information and research gap on this topic, so your participation will be extremely helpful in our efforts to share information among our educators and to inform decision- and policy-makers about educational practices in our profession.

The first phase of this study involves a survey of program directors about simulated learning activities in their programs. We expect to follow up with further inquiry and site visits in the spring to programs where simulated learning is in use. By completing the enclosed survey, you will contribute to the creation of a thorough picture of simulated learning in Canadian medical laboratory science. Your completed survey document will remain confidential and will be stored in secure files. Neither your name nor the name of your program will be used in any published documents or presentations.

The findings of our study will be submitted to Health Canada in the fall of 2007 and subsequently published in *CJMLS* and posted to the CSMLS web site. We also plan to present the outcomes of the study at Congress 2008 and in other educational and health care venues.

Thank you in advance for participating in this research project. We believe that the information it will afford us is vital to creating an evidence base for simulated learning in medical laboratory science. I would be happy to answer any questions you may have about this research, and I look forward to being able to share the findings with you within the coming year. Please let me know if you have any questions about this survey or the simulations project.

Please return the enclosed survey no later than March 12 2007. You may return your response in the enclosed postage paid envelope, or send it by fax to the CSMLS at 905-528-4968.

Sincerely,

Moira M. Grant, PhD MLT ART
Director of Research
905-528-8642 ext. 35
MoiraG@csmls.org

Appendix E – Cover letter template, French

Le 26 février 2007

Madame/Monsieur _____
[Titre]
[Nom de l'établissement]
[Adresse de l'établissement]
[Adresse de l'établissement]

Madame _____,
Monsieur _____,

Comme vous le savez, la SCSLM fait actuellement un sondage, financé par Santé Canada, sur l'utilisation de l'apprentissage simulé dans la formation en science de laboratoire médical. Comme il existe de grandes lacunes sur le plan de l'information et des études dans ce domaine, votre participation sera extrêmement utile aux efforts que nous faisons pour diffuser de l'information à nos éducateurs et informer les décideurs et les responsables des politiques sur les pratiques éducatives dans notre profession.

La première phase de l'étude, un sondage s'adressant aux directeurs de programme, porte sur les activités d'apprentissage simulé intégrées à leurs programmes. Nous prévoyons y donner suite au printemps en faisant plus ample enquête et en visitant les établissements où l'on utilise l'apprentissage simulé. En remplissant le questionnaire ci-inclus, vous contribuerez à tracer un portrait précis de la place occupée par l'apprentissage simulé dans la science de laboratoire médical au Canada. Le questionnaire que vous aurez rempli restera confidentiel et sera classé dans des dossiers sécurisés. Votre nom et celui de votre programme ne seront en aucun cas utilisés dans des documents ou des présentations publiés.

Les conclusions de notre étude seront présentées à Santé Canada à l'automne 2007 puis publiées dans le *CJMLS (Canadian Journal of Medical Laboratory Science)* et affichées sur le site Web de la SCSLM. Nous avons également l'intention de présenter les résultats de l'étude au Congrès national 2008 et dans le cadre d'autres rencontres touchant l'éducation et les soins de santé.

Nous vous remercions à l'avance de participer à ce projet de recherche. Nous croyons que l'information que nous en tirerons sera indispensable à la création de données factuelles sur l'apprentissage simulé dans la science du laboratoire médical. Je répondrai avec plaisir à toute question au sujet de cette étude et j'ai hâte de partager avec vous les conclusions du sondage au cours de l'année qui vient. Si vous avez des questions sur le sondage ou le projet des simulations, n'hésitez pas à m'en faire part.

Veuillez retourner le questionnaire ci-inclus avant le 12 mars 2007. Vous pouvez le poster dans l'enveloppe port payé fournie ou l'envoyer par télécopieur au numéro 905-528-4968.

Cordialement,

Moira M. Grant, Ph.D., TLM, ART
Directrice de la recherche
905-528-8642, poste 35
MoiraG@csmls.org

Note: Please Reply By March 26 2007

Appendix F – Survey 1 (programs with simulations), English

SURVEY ON SIMULATED LEARNING IN MEDICAL LABORATORY SCIENCE PROGRAMS

Your Name _____

Name of your institution _____

1. How do you define 'simulations' in your program? (i.e., what are the characteristics that differentiate them from other types of learning experiences?)

2. Are there other names by which simulated learning is known? (i.e., in your course calendar or by your instructors)

3. How are your simulated learning experiences scheduled into your program year? (i.e., number of hours or weeks, specific stage in the program, didactic *vs.* clinical)

4. What types of activities take place in your program's simulations?

5. Could you provide a brief description of your simulations to help us understand how they are implemented? (i.e., number of students/instructors participating at one time, specific sub-disciplines or topics they're used for)

6. How long have simulated learning activities been used in your program?

7. What are the reasons for using simulations in your program?

8. What are the factors that go into choosing which topics/parts of the program make use of simulations?

9. Are there learning experiences for which simulations are not appropriate? If so, what are they and what is it about them that makes simulation inappropriate?

10. What kinds of resources are required (time, staff, equipment, space) for implementing simulations that are not already part of your program?

11. What types of guidelines/models/educational resources were/are used to implement your program's simulated learning experiences?

12. Do your simulations have an impact on other aspects of the program or of other programs? (i.e., scheduling, use of space and other resources)

13. Were there unexpected outcomes from your implementation of simulated learning?

14. Do you have data on the costs of implementing your simulations that you would be willing to share with us (either now or at a later time)?

15. What criteria/methods/resources have you used to evaluate the effectiveness of the simulated activities?

16. If you could make changes to your current simulated learning experiences, what would they be?

17. Do you have any studies or data on your simulated learning experiences that you can share with us?

18. Are you aware of helpful research or studies on simulated learning in medical laboratory education? If so, could you share them with us?

19. What are your observations of students' responses to simulated learning?

20. What are your instructors' responses to simulated learning?

21. If you were asked to share your experiences and perspectives on simulated learning with your educator/MLT colleagues, what would you tell them?

22. Are there any other observations you feel are important to our understanding of your program's simulated learning experiences? (Please feel free to use another sheet of paper or to contact Moira Grant directly if you would like to expand on your answers.)

Thank you for contributing to our study. Please return this survey by March 26 2007. You may mail it in the envelope provided or fax it to 905-528-4968. If you have any questions, please contact Moira Grant (*MoiraG@csmls.org*).

Appendix G – Survey 1 (programs with simulations), French

Note : Veuillez répondre avant le 23 mars 2007

SONDAGE SUR L'APPRENTISSAGE SIMULÉ DANS LES PROGRAMMES DE SCIENCE DE LABORATOIRE MÉDICAL

Votre nom _____

Nom de votre établissement _____

1. Comment définissez-vous les « simulations » dans votre programme? (c.-à-d. quelles caractéristiques les distinguent des autres types d'expériences d'apprentissage?)

2. Quels autres noms porte l'apprentissage simulé (c.-à-d. dans votre calendrier de cours ou nom utilisé par vos chargés de cours)?

3. Comment vos expériences d'apprentissage simulé sont-elles intégrées à votre année de programme? (c.-à-d. nombre d'heures ou de semaines, étape précise dans le programme, didactique *par opposition à* clinique)

4. Quels types d'activités ont lieu dans les simulations de votre programme?

5. Pourriez-vous décrire sommairement vos simulations pour nous aider à comprendre comment elles sont mises en œuvre? (c.-à-d. nombre d'étudiants ou de chargés de cours participant à un moment donné, sous-disciplines ou sujets précis auxquels servent les simulations)

6. Depuis combien de temps utilisez-vous les activités d'apprentissage simulé dans votre programme?

7. Pour quelles raisons utilisez-vous les simulations dans votre programme?

8. Quels facteurs entrent en jeu dans le choix des sujets ou des volets du programme où l'on utilise les simulations?

9. Y-a-t-il des expériences d'apprentissage auxquelles les simulations ne conviennent pas? Dans l'affirmative, quelles sont ces expériences et en quoi les simulations sont-elles inappropriées?

10. Quel genre de ressources sont nécessaires (temps, personnel, équipement, espace) pour mettre en œuvre des simulations qui ne font pas déjà partie de votre programme?

11. Quels types de lignes directrices, de modèles ou de ressources pédagogiques ont été ou sont utilisés pour mettre en œuvre les expériences d'apprentissage simulé de votre programme?

12. Vos simulations ont-elles des répercussions sur d'autres aspects du programme ou d'autres programmes? (c.-à-d. l'établissement du calendrier, l'utilisation de l'espace et d'autres ressources)

13. Avez-vous constaté des résultats imprévus avec la mise en œuvre de l'apprentissage simulé?

14. Avez-vous des données sur les coûts de la mise en œuvre de vos simulations dont vous accepteriez de nous faire part (maintenant ou plus tard)?

15. Quels critères, méthodes ou ressources avez-vous utilisés pour évaluer l'efficacité des activités simulées?

16. Si vous pouviez apporter des changements à vos expériences actuelles d'apprentissage simulé, que changeriez-vous?

17. Avez-vous des études ou des données sur vos expériences d'apprentissage simulé que vous pourriez partager avec nous?

18. Connaissez-vous des études ou des travaux de recherche utiles sur l'apprentissage simulé dans la formation en science de laboratoire médical? Dans l'affirmative, pouvez-vous nous en parler?

19. Quelles réactions à l'apprentissage simulé avez-vous observées chez les étudiants?

20. Quelles sont les réactions de vos chargés de cours à l'apprentissage simulé?

21. Si on vous demandait de partager vos expériences et vos perspectives sur l'apprentissage simulé avec vos collègues éducateurs ou technologistes de laboratoire médical, que leur diriez-vous?

22. Y-a-t-il d'autres observations qui vous semblent importantes pour nous aider à comprendre les expériences d'apprentissage simulé de votre programme? (N'hésitez pas à ajouter une feuille de papier ou à communiquer directement avec Moira Grant si vous voulez étoffer votre réponse.)

Merci de contribuer à notre étude. Veuillez retourner le questionnaire avant le 23 mars 2007. Vous pouvez le poster dans l'enveloppe fournie ou l'envoyer par télécopieur au numéro 905-528-4968. Si vous avez des questions, veuillez communiquer avec Moira Grant à l'adresse (*MoiraG@csmls.org*).

Note: Please Reply By March 12 2007

Appendix H – Survey 2 (programs with no simulations), English

SURVEY ON SIMULATED LEARNING IN MEDICAL LABORATORY SCIENCE PROGRAMS

Your Name _____

Name of your institution _____

1. What are the characteristics of simulated learning experiences that differentiate them from the student labs already in use in your program?

2. Have you had any experience with simulated learning activities (previously in your current program, or in other programs)?

3. Are you contemplating introducing simulated learning into your program? Please explain why/why not.

4. What factors would you take into consideration in deciding whether to implement simulated laboratory activities in your program?

5. If there were no limits to the resources you could apply to implementing simulated learning in your program, what kind of activities would you implement?

6. Are there learning experiences for which simulations are not appropriate? If so, what are they and what is it about them that makes simulation inappropriate?

7. Are you aware of any helpful research or studies on simulated learning in medical laboratory education? If so, could you share these with us?

8. If you were asked to share your perspectives on simulated learning with your educator/MLT colleagues, what would you tell them?

Thank you for contributing to our study. Please return this survey by March 12 2007. You may mail it in the envelope provided or fax it to 905-528-4968. If you have any questions, please contact Moira Grant (*MoiraG@csmls.org*).

Appendix I – Survey 2 (programs with no simulations), French

Note : Veuillez répondre avant le 23 mars 2007

SONDAGE SUR L'APPRENTISSAGE SIMULÉ DANS LES PROGRAMMES DE SCIENCE DE LABORATOIRE MÉDICAL

Votre nom _____

Nom de votre institution _____

1. Quelles sont les caractéristiques des expériences d'apprentissage simulé qui distinguent ces dernières des laboratoires d'enseignement déjà utilisés dans votre programme?

2. Avez-vous de l'expérience dans les activités d'apprentissage simulé (auparavant dans votre programme actuel ou dans le cadre d'autres programmes)?

3. Envisagez-vous d'intégrer l'apprentissage simulé à votre programme? Veuillez expliquer pourquoi vous l'envisagez ou ne l'envisagez pas.

4. De quels facteurs tiendriez-vous compte pour décider si vous allez mettre en œuvre des activités de laboratoire simulé dans votre programme?

5. S'il n'y avait aucune limite aux ressources dont vous disposez pour mettre en œuvre l'apprentissage simulé dans votre programme, quel type d'activités mettriez-vous en œuvre?

6. Y-a-t-il des expériences d'apprentissage auxquelles les simulations ne conviennent pas? Dans l'affirmative, quelles sont ces expériences et quelles particularités font que les simulations ne leur conviennent pas?

7. Connaissez-vous des études ou des travaux de recherche sur l'apprentissage simulé dans la formation en science de laboratoire médical? Dans l'affirmative, pouvez-vous nous en parler?

8. Si on vous demandait de partager vos perspectives sur l'apprentissage simulé avec vos collègues éducateurs ou technologistes de laboratoire médical, que leur diriez-vous?

Merci de contribuer à notre étude. Veuillez retourner le questionnaire avant le 23 mars 2007. Vous pouvez le poster dans l'enveloppe fournie ou l'envoyer par télécopieur au numéro 905-528-4968. Si vous avez des questions, veuillez communiquer avec Moira Grant à l'adresse (*MoiraG@csmls.org*).

Appendix J – Raw response data (Survey 1)

Programs that offer simulated laboratory learning experiences

QUESTION 1

How do you define 'simulations' in your program? (i.e., what are the characteristics that differentiate them from the other types of learning experiences?)

"Simulation" means the work is the same or similar to the actual lab, but it takes place on [our institution's] premises
Simulations try to mirror the activities in a clinical institution for instance we have 8 hour lab days. Students prepare reagents, do instrument maintenance as part of the day
Offsite clinical practicum training Procedures and basic concepts are introduced in the didactic labs, while simulation allows students the opportunity to practice the skills required and follow specimens through from procurement, data entry, testing, resulting, to reporting as they would in the workplace Different handling situations for specimens are introduced: routine, priority, STAT Multi-tasking, troubleshooting and distractions (such as phone calls, STAT testing interruptions, sample integrity issues, etc.) are also introduced
A simulated lab is under the direction of an instructor, rather than a preceptor in an actual lab department. It involves practicing procedures rather than doing actual testing on samples. The samples may be simulated (e.g., CSFs). Theory is heavily reviewed. [Later comment from re: what differentiates simulated labs from regular student labs]: • guidance - an instructor is there to prepare the student and the student are far more 'real lab' ready then when there are with 'already busy' preceptors in the clinical lab taking care of the 'real work ' and the student simultaneously. • pace- the instructor can slow it down from the clinical pace and give individual attention to those who require it. Similarly it is faster pace then the didactic labs • samples are real - obtained from the clinical area (sometimes true for the didactic) • volume -is ramped up (unlike the didactic labs where the student learns) • complexity -is greater then the didactic labs where we do fewer things at once
An experience that is a bridge between didactic and 'real' clinical. Experiential learning: adds another layer of complexity to what was taught or learned in didactic Looking more at process than results
Placing students in a context where they will carry out a task similar to a work environment or review a set of competencies acquired during a course [Translation, MG]
Simulation is the ability to reproduce essential criterion of a task. The ability to perform the steps of the task is coupled with understanding why each criterion is required in order to validate the outcomes. This increases the skills of the student to perform more effectively during their clinical rotations and competency challenges
Laboratory sessions that model real-life clinical practice (6-7hours) as closely as possible in terms of application of theory, work flow, work-load (small hospital), trouble-shooting, quality control, safety, interpretation and decision-making. This is utilized in the final year of training for reinforcement of initial learning. How to differentiate from other types of learning (in our context): • not introductory • experiential • used for extended training periods (example: 6 hours/day x 3 weeks per discipline) • multitasking • independent decision-making • multiple specimens • active learning environment
Hands-on environment that re-creates clinical environment; typical situation; case-based scenario involves problem solving
All analytical tests carried out on fictional patients in our laboratory sessions in order to reproduce as closely as possible the routine of a clinical laboratory. In fact, the majority of our laboratories are set up as simulations. [Translation MG]

QUESTION 2

Are there other names by which simulated learning is known? (i.e., in your course calendar or by your instructors)

"lab"; "lab course"
Simulated clinical
Simulated clinical practicum

We call simulated labs ‘teaching labs’ or ‘student labs’ and tutorials (where we review theory, do case studies, etc.)
Simulated clinical experience
Final practical test scenario [Translation MG]
Labs, practical labs, performance activities
Simulated clinical courses; simulated Canadian experience
Apprentissage simulé
Patients fictifs; laboratoire multidisciplinaire integré

QUESTION 3

How are your simulated learning experiences scheduled into your program year? (i.e., number of hours or weeks, specific stage in the program, didactic *vs.* clinical)

It varies, but lab (‘simulated’) is 60% of the program. Labs begin second term, and run daily, with lectures as first class, labs rest of time.
Simulated clinical takes place in our clinical semester. It replaces a 6 week clinical block
669 hours of simulated experience in 22 weeks following the didactic/lab experience Hematology Simulation 150 hours Transfusion Medicine Simulation 94 hours Microbiology Simulation 150 hours Chemistry Simulation 150 hours Histotechnology Simulation 75 hours Two weeks were spent where Hematology, TM, Chemistry and Microbiology were combined in a simulated STAT lab scenario 100% clinical practicum experience was simulated at [our institution] – students did not enter a clinical site for any of their clinical practicum
We use simulated labs in Phase II of the program (clinical training year). There are student labs at the beginning of each discipline rotation for each group of students. Chem – one week; Micro – three weeks; Histo – two weeks; Hem – four weeks; Blood Bank – one week. Tutorials are approximately 2 – 3 hours per week
15 week semester at the end of year 2; between didactic and hospital/private lab based clinical
Most discipline specific courses have a specific number of hours attached to them that have a laboratory component in which laboratory procedures are performed and evaluated. Clinical courses do have some simulation attached to them especially in areas that the mentors are very busy and it is very labour intensive to either instruct a student or constantly provide a wide range of fresh samples so the student has a wide range of experiences, including rare pathologies. Examples of this are differentials (Normal, abnormal and bone marrows) and crossmatching blood.
Simulated learning schedule: • it occurs in the didactic setting • utilized in the final year • scheduled for 7 days x 5 disciplines (semester 6) plus 3 weeks x 5 disciplines (semester 7)
(post PLA by CSMLS): performance-based; theory-based course first, then simulated clinical; some go straight to clinical; flexible program; tailored to particular needs of student
In each subject it depends on the weighting of the course. For example, the course in Transfusion Science I has a weight assignment of 2-1-2. The first digit (2) indicates the number of hours of theory in a week for a period of 15 weeks; the second correponds to 1 hour of laboratory (simulated) per week for 15 weeks. On the other hand, some courses in the first year do not use simulated laboratories before the sixth week of the course. [Translation MG]

QUESTION 4
What types of activities take place in your program's simulations?

Urinalysis – analysis of urine, occult bloods Chem. – analysis of serum (glucose, bili, protein, etc.) Hem – analysis of blood (diff, making smears, blood counts, hemoglobin, coag, LAP) Histo – analysis of tissue (cutting, staining, microanatomy, decal, etc.) Transfusion – type, screen, x-match, [elutions?], transfusion reaction investigations
Histo: microtomy, special stains, H&E, assessment of staining, troubleshooting, tissue ID Chem: analysis with various analyzers TM: antibody identification Micro: ID of bacteria, culture & sensitivity Hem: morphology, automated instruments Emphasis on problem solving & critical thinking
Use of Lab Information system for patient entry, test ordering, result entry, delta checks, pending logs, result flagging (criticals) Both written and practical assessments performed Quality control was practiced and stressed in all disciplines Histotechnology: Grossing specimens, processing, embedding, sectioning, staining and coverslipping, special stains, microanatomy microscopy, cryotomy Microbiology: Gram stain, direct smears, plating specimens, work-up of unknowns from all body sites, API identification, tube test identification Hematology: daily maintenance and QC on analyzers, blood and CSF samples for manual and automated hematology procedures, coagulation, differential microscope work Urinalysis: manual and automated dipping, microscopic analysis, pregnancy testing, occult blood testing Transfusion Medicine: routine types and screens, crossmatching, postnatal moms and cords, FMH testing, full antibody investigations, tagging and issuing, transfusion reaction investigations Chemistry: Osmometry, glucometers, data entry, electrophoresis, automated analyzers including the Vitros 250, Integra and Elecsys, lab math including creatinine clearance calculations, urine and serum sample types were tested Hospital Simulation: all disciplines except Histology were integrated into STAT lab setting. This presented a valuable opportunity for students to practice multitasking, teamwork, communication and other soft skills. The students were given a routine workload which they divided among themselves; they also need to produce daily work schedules Phoning of critical or STAT results to the physician, answering phone calls from the physician, prioritizing workload and re-prioritizing for STAT/priority samples
Hematology - differentials and morphologies (peripheral smears, bone marrow, CSF & fluid cytospins) - manual counting procedures (WBC, PLT, Retics, CSF, fluids) - special hematology procedures (osmotic fragility, Prussian Blue Fe stain, G6PD Screen, LAP stain, stains for Heinz bodies, Giemsa stain and malaria smears, sickling & solubility tests for HgBs) - case studies Biochemistry - urinalysis tutorial, macro dipping, microscopic - manual pipetting techniques; vitamin C, carotene, glucose precision pipetting - chromatography techniques – column (TLC), two dimension glass, one dimension glass - hereditary disease program lecture - GCMS lecture Blood Bank - pretransfusion testing - ABO & Antibody screen - Antibody identification - crossmatch - DATs - Transfusion reaction investigation - any procedure not covered at all sites Microbiology - Gram stain, spore stain, flagella stain - direct smears & cytospins - colonial morphology - identifying tests - virology, mycology & anaerobes lectures

- safety techniques for Level III labs - Level II and Level III organisms - two sets of unknowns - lecture on Bordetella Histology - microtomy - staining (H&E, Trichrome, PAS, GAF, Oil Red O, Gordon & Sweet's)
Simulation in 5 disciplines Interprofessional collaboration course (with students from other programs) Leadership course
- identification of microscope slides - testing for biochemical levels with instrumentation - bacterial identification [Translation: MG]
-Phlebotomy, differentials (normal, abnormal and bone marrow), cross matching blood, blocking tissue and making slides for histology. To optimize learning opportunities, specimens for many disciplines are manipulated and integrated into labs to mimic pre-analytic, analytic and post-analytic conditions found in industry.
Activities reflect routine laboratory procedures which one would find in a small laboratory; limited only by college equipment and supplies and time.
Labs, quizzes, write exam; assessed in competencies
Simulation of tests ordered on imaginary patients, as if the student was working in the hospital. [Translation MG]

QUESTION 5

Could you provide a brief description of your simulations to help us understand how they are implemented? (i.e., number of students/instructors participating at one time, specific sub-disciplines or topics they're used for)

10 students per instructor; same in all labs; e.g. Hematology: students get their tubes of blood in the a.m., and have a worklist to perform on them thought the lab; E.G., Histo: students cut the blocks, do assigned stains, examine the stains and ID the tissue and evaluate the stain
4 students per instructor There are five clinical instructors (one for each discipline) We have 28 students rotating in groups of 4 Used in all disciplines (see answer to question 4)
Students will rotate through 5 disciplines in 3 week blocks Student:instructor – 8:1 IPC (interprofessional collaboration) will also be a simulation experience
All the students carry out [la situation problème finale] individually The activity is supervised by the instructor with occasional help from a technician [Translation: MG]
Didactic-1 to 2 instructors per 8 students in Chemistry, hematology, coagulation, microbiology, transfusions, histotechnology staining and microanatomy labs -1 instructor for every 2-3 students in histotechnology embedding and cutting labs. Clinical-1 instructor to 1-2 students for all simulated activities.
Simulations are used in all 5 disciplines, in small group settings (maximum 14 students, average is 8-10 students to one instructor). We simulate most routine laboratory procedures.
2 MLTs teach a class; class size 8-15; 2 TAs
For example, in the Transfusion Science course : a lab with three different patients per student, and this for a total of 20 students. Each student has different made-up patients. They have to do an ABO-Rh typing. Several cases are circulated. Different ABO groups, different Rh, different antibodies, etc. The instructors may be on their own in the lab or they may have assistance from a technician. [Translation MG]

QUESTION 6

How long have simulated learning activities been used in your program?

The 70s
3 years
This was a one time pilot project from May – September 2005
Since [the program's] inception – 1961?
Simulation semester will be implemented in May 08
Since the implementation of the new program in 2003 [Translation: MG]
We have used similar laboratory processes to some extent since the program began in the early 1970's, however more so since 1997. In 1997 the responsibility for clinical instruction was added to the SIAST programming. The term "simulated learning activities" has arisen more recently; in retrospect it appears to describe what we've been doing in the last 10 year.
Simulated experiences have been used since the program was developed (30+ years)
Since 2003 or 2004; program started in 2002 with some simulation but not what is available now
Since my time as a student in [the program] (1988 to 1991) and then as instructor (since 1998). [Translation MG]

QUESTION 7

What are the reasons for using simulations in your program?

1. History 2. Our practicum is short Philosophy: do what you can at the school well, let the practicum in the hospital do what they can do well
Shortage of clinical placements Prepare the students to a better degree for clinical Lessen the required time at clinical institution to increase the number of student placements
The students in the program would not have been exposed to a practicum due to shortages of clinical sites willing or able to train students
Simulated labs help to bring student skills up to a standard acceptable to enter the real lab (makes it easier for preceptors). Helps with scheduling in the department (can't have all 28 students in the lab at one time).
To better prepare students for hospital/private lab-based clinical To decrease burden on clinical sites
Requirement of a competency-based program [Translation: MG]
Didactic-to provide hands on learning and reinforcement of procedures learned in texts and manuals as well as to help ensure readiness of students to proceed to clinical training. **Clinical**-to ensure students receive a wide variety of patient situations which may not occur for the short time the student may be training in that area. Also, if the workload or other factors, such as staffing shortages, workflow volume etc, hinders mentors from working one on one with students, with active specimens, the instructors will provide simulated experiences.
Historically the reason for using simulation is based on a short clinical practicum length (15 weeks) as a supplement to the clinical practicum. The opportunity to increase clinical practicum length has not arisen.
Limited number of clinical placements; issues with IEMLTs, i.e., safety; way to orient to Canadian practice; prepare for Canadian environment
To permit the student to adapt to and get familiar with tests ordered in the clinical site. To permit the student to get used to the context for clinical testing. To permit the student to be better prepared for clinical placement. [Translation MG]

QUESTION 8

What are the factors that go into choosing which topics/parts of the program make use of simulations?

See philosophy above! e.g., we can spend hours on an assortment of differentials or tissues; hospitals don't so we do it here. Our instrumentation is limited so hospitals do it.
Try to think of scenarios that would be common/relevant to all clinical sites, e.g., importance of QC
The entire clinical practicum was simulated for this program The Competency Based Objectives (CBO) evaluated for the two year program clinical practicum were also evaluated in this five month simulation Some small revisions to CBOs were made to adjust for time/sample/reagent constraints
Some procedures are very labor intensive for the department (e.g., diffs). Some procedures require time to practice so that competence increases
Determination of which topics/parts are better accomplished where (institution vs. hospital/private lab) Consistency in learning experience from student to student Availability of samples

Scenario that permits encompassing elements adequately in order to evaluate the student's competence in a specific domain [Translation: MG]
How much and how easy the exposure to the area in the clinical field can be
Factors associated with simulation use: • most theory should be completed • introductory labs completed • availability of extended laboratory hours • routine procedures only • available equipment and supplies • available samples (received from local hospitals) or simulated samples
Look at competencies; simulate the ones that are common in practice
The relevance of the tests. The authenticity of the simulation. Covering the most frequently-encountered cases. [Translation MG]

QUESTION 9

Are there learning experiences for which simulations are not appropriate? If so, what are they and what is it about them that makes simulation inappropriate?

Yes – instrumentation; workflow: we can't simulate the same intensity
If the appropriate resources are available ($, equipment, personnel, safety resources, tissue/specimens), I think that just about everything has the potential to be put into a simulated situation
We managed to simulate all scenarios required for the CBOs although clinical practicums can handle some situations better i. Instrumentation at clinical practicums gives the student a better appreciation for sample volume and variety of instruments in the workplace ii. Microbiology samples were difficult to doctor and we experiences problems with bacterial growth and contamination. This would be much improved in a working lab situation iii. Transfusion medicine used simulated products for issuing. Although students didn't use the real products, they were very well simulated and the students were exposed to more opportunities to issue than they possibly would be in a working lab. iv. Hematology specimens flagged on the automated instruments due to aging of the samples. Again, a high volume lab would give a better picture of the 'normal' frequency of sample flagging
Instrumentation is not generally appropriate because it is expensive to buy, not used on a day-to-day basis, and costs lots to buy the reagents
Not able to duplicate volume and sense of urgency in providing service Not able to provide first hand knowledge of or appreciation for legislation and regulations governing lab practice Cannot provide full range of samples and instrumentation
-Simulation is not appropriate for procedures that call for extensive patient contact. This is not to say the procedure cannot be started as a simulation (such as phlebotomy) but practice on real patients is essential for proper learning. -Large workload (volume) and distractions found in a laboratory setting (such as phones machine noise) are very hard to simulate.
We cannot identify any experiences which are not appropriate to simulated, however the following are difficult to simulate: • High sample volume • Workplace stress and pressure • Interpersonal interaction with other health care professionals • Answering the phone • Procedures requiring expensive instrumentation • Variety of blood products • Consequences of one's actions – knowledge that one is using a 'real' sample • Confidentiality of patient information • Laboratory information system • Bar coding • Grossing procedures in histology
Simulations are used in all courses. [Translation MG]

QUESTION 10

What kinds of resources are required (time, staff, equipment, space) for implementing simulations that are not already part of your program?

Time & equipment
It would be nice to have funding for further instrumentation and dedicated lab space. We currently run our simulated labs at our [X] Campus in the Chemical Engineering area
The program was 100% simulated so this question does not apply to this program
They are already part of the program
Will be making use of equipment and space at a time when we normally don't have students (spring/summer) Staffing requirements will change slightly with additional semester Agreement with hospitals for provision of samples (and all that that implies – ethics, privacy, transportation, etc.)
Time, staff, equipment, and space at the college are all required to provide simulated experiences for the students. Our program handles the simulation it does now with the resources it has but to increase simulation, these would all have to be increased. There is also a limitation by the college on the amount of time that would be allowed to be added to the program. Space in clinical sites (classroom or student area in the lab) is very restricted as well.
The elements associated with implementation would be: • Dedicated laboratory space for significant periods of time • Ample equipment and supplies for small groups to multitask and do repetitive testing • Source of adequate numbers of samples • Dedicated faculty
People; everything that is needed in a real lab • High cost of reagents • Use simlabs; Schedule after hours and weekends; most candidates are working during days; FT students not around at those times
We want to implement a multidisciplinary case-based integrated simulation for our fall 2007 session. We will need the participation of all the teaching staff as well as a lot of time from each in order to develop the clinical case studies that our labs will use as well as equipment to carry out the various analyses. In addition, the support of technicians will be essential and the reagents to be used will require funding. [Translation MG]

QUESTION 11

What types of guidelines/models/educational resources were/are used to implement your program's simulated learning experiences?

Before my time, I'm afraid
Spoke to other MLT programs that had used simulation to understand the pros and cons and challenges of implementing simulation. On staff educational resources (Masters in Education faculty)
MLT two year program course packs and competency based objective booklets Existing lab space and equipment at NAIT and capital purchased through Alberta Advanced Education program development funds BCIT and Mohawk program information Recent industry experience of all staff involved in the project Hospital and private labs supplied samples and advice for simulation [Our institution's] staff involved in the second year clinical practicum Full day tours of private and hospital labs were arranged to expose students to the workplace
Guideline: want to bring the students up to a certain level so they can 'hit the ground running' when they enter the real lab. Student lab materials are all self-generated by the institution.
Clinical partners were crucial Research department → interprofessional collaboration, assessment of readiness for clinical, knowledge [about?] simulation within and outside of allied health profession (medical models, aviation) Curriculum commons team → curriculum development
In terms of guidelines - a task to complete that represents a challenge for the student - it is a real problem for which the solution is not evident - it resembles an authentic situation - it must call upon knowledge, skill and attitude [Translation: MG]
There were no guidelines given. Simulations were developed as necessary by the instructors, to help ensure student success and to fill in the gaps where students were not able to receive the necessary hands on training due to limited clinical resources (both clinical staff and specimens required). Clinical currency by faculty ensures an accurate representation of the industry expectations.
We use five separate laboratories where small groups of students can simulate real-life, competency based clinical

practice for extended periods of time. We use the real world as a model.
What is required in the clinical site as opposed to what is required of the students [Translation MG]

QUESTION 12
Do your simulations have an impact on other aspects of the program or on other programs? (i.e., scheduling, use of space and other resources)

Scheduling is difficult, but we've done it for so long, we are very good at it!
Definitely on scheduling and program costs since this is the most expensive part of the program
The bulk of the simulation was scheduled during the summer months when other programs at [our institution] were not using the labs In May and September, lab space was juggled to meet the needs of all programs; Some programs ran labs earlier or later in the day than previously scheduled to accommodate the clinical simulation lab space requirements
It helps with scheduling. Each area needs it own student lab, instructor, and supplied (reagents, media, etc.)
Hospital/private lab – based clinical will be reduced from 36 weeks to 20 weeks All programs at the [our institution] involved in [interprofessional communication] courses/activities
Other programs, such as chemistry, do their final test labs with our students No problem with scheduling because it is planned for in the course schedule [Translation MG]
-Simulation has a large impact on the space we are assigned, especially in didactic. Our program has two labs to share between 4 programs, so equipment must constantly be set up and taken down to make room for the next lab or program. The setting up and taking down of equipment requires an enormous amount of repeated preparation time by the faculty. -Simulation requires extensive creative scheduling to keep all students active with the minimal equipment available.
Our simulations do not impact on other educational programs, however, scheduling of labs can be challenging at times when all students are on campus together. Simulations have allowed us to have a relatively short clinical practicum. Students are exposed to a wider variety of testing methods/applications at the college prior to their clinical practicum; therefore students enter the clinical practicum with a broader based practical background.
Schedule definitely; don't do continuous labs; extended weekends for 4 weekends; 15 hour weekend; can't do other lab-based courses, have to coordinate with other courses, FT program; need logistics for ordering reagents and other supplies

QUESTION 13
Were there unexpected outcomes from your implementation of simulated learning?

No
Level of satisfaction of students was higher than expected
The two weeks of hospital simulation where all disciplines except histology were incorporated turned out to be a better experience than initially anticipated. Well worth the effort as the need for teamwork/multitasking/communication and soft skills was well demonstrated to and grasped by the students Staff burnout: the workload was greater than anticipated and staff carried a larger load than initially anticipated. The emphasis on quality control procedures resulted in a greater understanding of this concept – prior to simulation it was felt that this concept was realized by the students – during simulation, the importance of this concept seemed to solidify for many students
No
TBD
-Students felt much more comfortable in the clinical setting because of simulation they experience beforehand. They became familiar and adapted faster to the procedures performed in the clinical setting. -Instructors were able to assess quite accurately which students would struggle in the clinical setting and be prepared to offer them remedial assistance if required. -Mentors have noted students are very well prepared when they come to the clinical sites to train.
No, we have always had a simulated component
Yes. Things never go as planned.[Translation MG]

QUESTION 14
Do you have data on the costs of implementing your simulations that you would be willing to share with us (either now or at a later time)?

Yes at a later time
The simulated clinical is costly and more expensive than sending that student out on a clinical experience
The budget for simulation was imbedded in the total project costs for this pilot program so figures for simulation costs can not be broken out. Costs for simulation are high. Running a lab for simulation is very expensive due to reagent/equipment costs and

high instructor:student ratios required A proposal for 8 weeks of simulation for the MLT two year program was recently submitted with costs estimates at approximately $800,000.
Costs would include the instructors' salaries and the cost of the supplies and equipment
Don't make money; lose money; can't charge students what it costs Will try to get info on costs
No. We must operate within a common budgetary limit for the whole department. However, we may be able to obtain this data if necessary. [Translation MG]

QUESTION 15

What criteria/methods/resources have you used to evaluate the effectiveness of the simulated activities?

Feedback from employers and students Especially important is the feedback from hospitals which take students from other programs; We compare very favourably
Surveys of student/employer satisfaction Tracking of student success on certification exam of students who did simulated and institutional clinical vs. students that did institutional clinical only
Competency Based objectives were evaluated with practical assessments as well as theory written exams
Student evaluations Comments from the technologists (preceptors) in the department
Criteria and methods being developed
It's based on the results obtained by the students, the difficulties in observing the evaluation criteria, the time needed to carry out the activity [Translation: MG]
• Course and program evaluations carried out by both students for each course (didactic and clinical) • Annual student surveys on the program • Evaluations provided by program staff on the courses they teach . • Mentor evaluations after they work with students. • Student success on national exams • Favorable Employment statistics. • Employer satisfaction surveys • Graduate satisfaction surveys
Tools used to evaluate the effectiveness of the simulated experience: • Positive feedback from teaching technologists (in clinical sites) validating student preparedness • Students' performance on national examinations has been at the national average or above • Student feedback/course evaluations are mostly positive
No formal evaluation; Have addressed initial issues satisfactorily Employers more receptive to taking students for clinical placements (are phasing them out); not all have CP
Known specimens: samples simulated by us; blind specimens from the clinical site for which we know the result Unknown specimens for some simulated activities [Translation MG]

QUESTION 16

If you could make changes to your current simulated learning experiences, what would they be?

Take some out of simulation and into the hospital
I would have more instrumentation and more faculty so ratios could even be lower
Build more student/instructor time for feedback and evaluation Decrease the instructor:student ratio to 1:3 or 1:4 (maximum) Increase the educational technologist role (people who prepare the labs/samples/ order reagents, etc.) for simulation) from 0.5 FTE to 2.0 FTE Increased budget for supplies – to allow more volume of samples to be processed by students. Automated instrument reagents are expensive, but this is an area where it is important to simulate higher volumes of testing.
We would decrease the amount of time in some student labs if possible (e.g., decrease Hematology from 4 weeks to 3 weeks).
We adapt things as needed as we go along
Have more of them. Our program is limited by time, space and available equipment so expanding the simulated experiences is not possible at this time.
Changes to current simulated learning experiences: • More financial resources (equipment and supplies) • Smaller student/teacher ratio (4-6:1)

• More support staff to aid in lab preparation
We would like to be able to rely more on the disciplines themselves (to make connections among them). [Translation MG]

QUESTION 17
Do you have any studies or data on your simulated learning experiences that you can share with us?

At a later date
Just tracking info and student satisfaction survey
Simulation debriefing notes from simulations project previously submitted; Final MTA report to the federal government being prepared. Deadline for submission of this report is June 2007. If requested, a copy may also be made available.
We don't have this kind of data because it happens on a weekly basis. [Translation MG]

QUESTION 18
Are you aware of helpful research or studies on simulated learning in medical laboratory education?

No
Only anecdotal info
Unaware of any
Not for medical lab education specifically but we are working with an expert (consultant to our institution) in the field of simulation
"Identifying Best Practices for Clinical Practice Education" March 2006. A Project of Health Canada-Health Human Resources Strategy." This study focused on Registered Psychiatric Nursing (RPN), Licensed Practical Nursing (LPN), Medical Laboratory Technology (MLT), Medical Radiography Technology (MRT) and Diagnostic Medical Sonography (DMS) in the four western provinces.

QUESTION 19
What are your observations of students' responses to simulated learning?

They have difficulty thinking they are 'real'. Especially those with lots of university. It takes 6 months to get them from thinking of tests as 'experiments'. But they do seem to appreciate learning and making mistakes HERE, instead of at the hospital, in front of a potential employer
Very high level of satisfaction
There was a lot of apprehension prior to simulation especially regarding evaluation of practical skills Once simulation was underway, the majority of students relayed their appreciation of the experience and they felt it was a very good learning experience for them.
They feel they are important, and a good preparation before going into the real lab. They get consistent preparation.
Students looking forward to it
These activities permit students to know their strong and weak points and therefore to improve them in order to achieve true competence [Translation: MG]
They like it and appreciate it. It helps them develop good techniques and practices before going to clinical which increases their confidence. Clinical training times are short, so this is important to them.
Students tend to have a positive response to our simulated clinical semesters. The student feedback indicates that the simulated learning: • Facilitates integration of theory and practical • Teaches time management • Gives and indication of 'real world' environment • Permits day to day flexibility
Students appreciate simulations; increased confidence in Canadian-based practice
Permit the students to have confidence in their ability to perform the testing. Permit lessening exam stress. Permit students to appreciate the importance of the tests. Permit attaching a true importance to the specimens to analyze. Permit making the studetns aware of and secure in their future roles and responsibilities. [Translation MG]

QUESTION 20
What are your instructors' responses to simulated learning?

It takes a lot of time and energy, but we are happy with the product
Instructors felt it was a positive learning experience

Instructors felt this experience was imperative for the students in this program and felt the students' knowledge and practical skills were greatly enhanced. The workload was greater than expected and the instructor:student ratio of 1:7 was too low. It would have been more effective with a lower ratio and increased educational technologist support. Instructors would have liked to have the opportunity to build on the work and experiences from this simulation for another intake.
We feel they are important and helpful, but repetitive for us to do (i.e., we do it seven times over – with each group of 4 students)
Has changed over time. Resistance by some at first, most are now enthusiastic as we get to final stages of development
We don't have a course instructor [Translation: MG]
It is time consuming, and takes more work however, most consider it necessary. The shortage of mentors in the clinical training sites and the limited weeks allotted to clinical training make it necessary to give the students a stronger background before they train in the clinical setting.
Instructors responses to simulated learning • It is a long teaching day (usually 6 hours in the lab) • It allows instructor to identify weaknesses and institute remedial action • In large groups it is difficulty to supervise all students individually, at the same time • Weaker students can take more time so that all students may not get equal attention • Allows instructor to integrate multiple aspects of a clinical case
Rewarding to help IEMLTs
Assures them that the concepts are well understood, theory as well as practice. Assures them that the competences have been attained. [Translation MG]

QUESTION 21

If you were asked to share your experiences and perspectives on simulated learning with your educator/MLT colleagues, what would you tell them?

It takes a few years to get used to, but it is so worth it! It keeps you, as an instructor, in touch with what you are teaching. It keeps you feeling part of our profession
I think that if you have enough resources to develop and deliver simulated learning, it is something that should be the building block for further clinical experience. It is a very labour intensive process delivering simulated clinical but a very beneficial one
I believe simulation is a very viable alternative to clinical practicum training and will be required in the future to offset the shortages of clinical sites able to train students with the increased need to address HR shortages in the lab field. Interprofessional simulated health care centres could be a great opportunity for future student training in lab and other health care fields Simulation is expense: high instructor:student ratios are imperative as are reagents to ensure sample volume. A great amount of preparation is required for simulation and staff delegated to this task should have sufficient FTEs to accommodate for this
We do student labs in 'real time', i.e., as they need it. They get a simulated lab at the start of each rotation throughout the year, not in one big lump at the beginning.
NA at this time For transition → buy-in and involvement from clinical partners very important; support from academic institution and clinical partners crucial
These simulations should be followed up on because they permit verifying integration and mastery of the competences [Translation: MG]
Simulated learning is beneficial for all the reasons mentioned previously; however it should never replace hands on clinical training. It can enhance it but never replace it totally.
Shared experiences regarding simulation: • It is an effective strategy to accommodate a shortage of clinical sites or a reduction in clinical placement time • It has been effective for us over the years and we are comfortable using simulations • Students are introduced to a wide variety of testing methods/approaches at the college that may be applicable to many clinical sites • Allows for more hands on practice prior to clinical placement • Permits students to be challenged to analyze situations and think critically in decision-making
Wish for money to support very costly simulations Have to cancel courses if sufficient numbers not present Make money with theory-based courses

Will call if she can release $ figures
We believe that it is a matter of an indispensable step to make the student competent for integrating the clinical experience. We believe equally that they are important for reflecting the clinical environment that the student will encounter as much as possible. [Translation MG]

QUESTION 22

Are there any other observations you feel are important to our understanding of your program's simulated learning experiences?

Not at this time
The only other point I want to highlight is that students receive 18 weeks of clinical in our program. Some students spend 18 weeks at a clinical institution, others do 6 weeks of simulated clinical and then 12 weeks in a clinical institution
I feel this survey has captured our simulation at [our institution] for the internationally trained MLTs attending the MLT Accelerated program from November 2005 to September 2006. Feel free to contact me should you have any further queries.
Current laboratory component of courses is low level simulation. Answers to questions in this survey reflect what will occur in new simulation semester and not current laboratory sessions in first 2 years of program
[Our] simulated learning experience is integrated into both the didactic and clinical portions of the program. At this time there is not a course called Simulation, however the labs in each of the courses that contain labs do strive to simulate the clinical experience, while building on basic laboratory skills.

Appendix K – Raw survey response data (Survey 2)

Institutions that do not offer simulated laboratory experiences

QUESTION 1

What are the characteristics of simulated learning experiences that differentiate them from the student labs already in use in your program?

Characteristics that would differentiate a simulated environment would include a lab which hosts 4-5 disciplines per training session. A presentation of this type would represent an authentic safe environment for learning. Students would be located at different discipline benches at the same time and rotate through the learning environment. Currently, all students are completing one course or discipline per lab session. The specimens are either mocked to simulate a true sample and this could be enhanced by having students work on real specimens from the clinics. Further enhancement of simulation would include a laboratory information system, computers and phones for followup of specimen protocols.
Procedures and basic concepts are introduced in the didactic labs, while simulation allows students the opportunity to practice the skills required and follow specimens through from procurement, data entry, testing, resulting, to reporting as they would in the workplace Different handling situations for specimens are introduced – routine, priority, STAT Multi-tasking, troubleshooting and distractions (such as phone calls, STAT testing interruptions, sample integrity issues, etc.) are also introduced
Not currently using simulated lab procedures
A simulated lab will put the student in a situation that attempts to resemble the work flow of a hospital lab, with several activities going on at the same time. Other labs will focus on only one or a few aspects of the laboratory testing in a discipline. All labs have some aspect of "simulation". As much as possible, we try to base our techniques on those currently in use by our clinical sites.
We try our best to create "real" patient samples that students have to follow through the testing process. The samples are "doctored" to create problems and they use the techniques and equipment that they have learned – to test the sample, perform follow-up testing where necessary and conclude the problem. Currently we are limited, we do not have a lot of equipment – but hopefully will get there.

QUESTION 2

Have you had any experience with simulated learning activities (previously in your current program, or in other programs)?

I have limited personal experience with simulated learning activities. However, I am studying this area in my Masters program. Simulated environments could include robotics, computerized programming or medical life-like manikins. [Our institution] SAIT has recently constructed a simulated learning environment for the Paramedic program to include an ambulance and a hospital emergency work environment. The manikins are computerized and operated by a computer programmer to present different life scenarios to the students to work through. The learning environment is video taped for debriefing of the student reactions or completion of procedures. Other students have the ability to watch the scene as it plays out and discuss how they may have handled the scenario differently.
The MLT Accelerated program at [our institution] utilized a 22 week simulated clinical practicum from May – September 2006
No
No
As above. We do have any computerized simulations to work with.

QUESTION 3

Are you contemplating introducing simulated learning into your program? Please explain why/why not.

[Our] MLT program has proposed a simulated laboratory environment which is pending government approval. The simulated work environment was a recommendation from our advisory group and Alberta Medical Laboratory Steering Committee. The purpose of the environment will alleviate the pressures of training in our clinical sites and possibly increase the number of trained graduates. Renovations of one lab will be complete in June 2007 and new equipment has been purchased to assist in training.
The MLT program at [our institution] has been given simulation development funds from Alberta Health and Wellness. Unfortunately the implementation funding was not approved by Alberta Advanced Education for this year – we may proceed if approved in the summer of 2008 with an 8 week simulation (to replace 8 weeks of the 42 week clinical practicum – leaving 34 weeks in the clinical practicum)

Yes, but depends on lab space availability and capital to purchase appropriate instrumentation
We currently have 3 courses in the Fall semester of the third (final) year with labs that could be considered "simulated labs" – Histotechniques, Transfusion Science Practices and Introduction to Core Laboratory. In Histotechniques, students process and embed tissues and then cut and stain the sections. This is spread over two lab periods during the week. In Transfusion Science Practices, students perform pre-transfusion testing for specimens, including antibody identification and crossmatch. However, students do not use Traceline (the information system used by all Transfusion Services in Quebec) and we do not have a bank of donor units as in a hospital. They also do not prepare any blood products. In Core Laboratory, the three components (Biochemistry, Microbiology and Hematology) have some aspects of simulation. In Biochemistry, students are given a specimen with a requisition for a series of lab tests (according to certain profiles). In Microbiology, students process specimens according to benches in a 6 hour lab. In Hematology, students receive specimens and set up routine tests, including CBC and reading smears in a 6 hour lab. These labs are designed this way to help prepare students for their internship, which follows directly after these courses.
Absolutely plan to do this. We are faced with placement challenges, may have to decrease out intake numbers if things do not improve for clinical placements. We are hoping that a simulated lab will help with some of our challenges. (Histo, micro and transfusion labs are becoming a challenge for placements).
We don't have the necessary budget to develop this kind of teaching activity [translation MG]

QUESTION 4
What factors would you take into consideration in deciding whether to implement simulated laboratory activities in your program?

After many years of meetings, factors that were considered included effective and manageable learning, ongoing operating budget, facility enhancements and renovations and length of actual clinical experience required to effectively train students. In reviewing the current competencies completed during practicum, it was decided to move 16 weeks worth of competencies back to [our institution] from the clinical sites. These decisions were based on [our institution's] resources, equipment, workload, and effective learning. For example, the differential competency could be completed at [our institution] with effective learning, minimal operating resources and equipment required. However, the Automated Hematology analyzer would be more effective and efficient to stay at the clinical site due to volume of workload, troubleshooting, and other environmental factors related to sending out reports.
Lab space Sample availability from clinical sites Can the simulated activity be performed as well or better than if it took place at the clinical site? Instrumentation available at [our institution] Staffing requirements Will simulation increase the number of student placements accepted by clinical sites?
1. lab space availability and capital to purchase appropriate instrumentation 2. outcome of student (ability to mimic 'real life' situations) 3. continuing education offered to faculty related to instruments 4. support from lab equipment/reagent suppliers
Factors would include: • Adequate instrumentation for all students • Students schedules that would accommodate long labs or several labs over a week • Ability to organize a complex set of activities in the same lab • Access to many specimens with different results • Level of student comprehension to be able to handle the full range of the experience (i.e., 3rd year)
• Money • Lab space – currently we do not have the space • Support staffing • Faculty etc
• The first factor would certainly be the resources made available to us • Secondly, we would need a clear demonstration that the students would see significant benefits considering the effort and costs that would be invested [Translation MG]

QUESTION 5

If there were no limits to the resources you could apply to implementing simulated learning in your program, what kind of activities would you implement?

Interprofessional simulation – where other health care professionals would interact with lab personnel to make the experience even more real for the student Increased testing on state of the art instruments 1:1 staff to student ration Purchase of controls/slide sets/reagents/media etc. to decrease the educational technologist preparation requirements
Core lab practices; spend more time on sample accessioning/processing; QC
We are not interested in developing more simulated labs. It's not a question of resources. It's a matter of the quality of training. Our clinical sites train our students better than we could ever accomplish in a simulated lab.
I am not familiar enough with what is available at this time. However, we would like to create: • a core lab environment with some equipment • Grossing/pathology area (we have a vet tech program so lots of fresh tissues can be obtained) • Microbiology area with actual equipment (ie. Blood culture machine) • Definitely want to create an LIS that is linked to all areas.
The same activities that students carry out during our current clinical rotations in the clinical sites [Translation MG]

QUESTION 6

Are there learning experiences for which simulations are not appropriate? If so, what are they and what is it about them that makes simulation inappropriate?

Yes, and we have determined which [of our institution's] competencies would be best completed at the SAIT or remain at the clinical site. Decisions included workload volumes, troubleshooting, work environment stressors, resources (maintenance contracts, costs of equipment and renos)
Blood collection procedures on infants or elderly patients as well as ill patients cannot be simulated Microbiology specimens are difficult to simulate and keep bacteria viable for teaching purposes
Real life 'stats' and critical samples. Students need to understand the pressures of laboratory life in the real world
There is no way to simulate the work day "stress" or constant flow of specimens, activities, problems to resolve as well as the dynamic nature of the workplace and interaction with people.
I am not sure, I do believe we could create any "real" life experience if we had the equipment and other resources to maintain it.
Undoubtedly, one of the disadvantages would be patient contact, which is very difficult to simulate in a meaningful learning experience [Translation MG]

QUESTION 7

Are you aware of any helpful research or studies on simulated learning in medical laboratory education? If so, could you share these with us?

We are working on this process and will share if we find out anything.
No, I am not aware of any research or studies on MLT simulated education
Not at this time
No
Our nursing department has a new simulation lab. You would have to follow up with our Dean.
I've heard that these kinds of activities are taking place in the Halifax college [Translation MG]

QUESTION 8

If you were asked to share your perspectives on simulated learning with your educator/MLT colleagues, what would you tell them?

I believe simulation is a very viable alternative to clinical practicum training and will be required in the future to offset the shortages of clinical sites able to train students with the increased need to address HR shortages in the lab field Interprofessional simulated health care centres could be a great opportunity for future student training in lab and other health care fields Simulation is expensive; low instructor: student ratios are imperative as are reagents to ensure sample volume A great amount of preparation is required for simulation and staff delegated to this task should have sufficient FTEs to accommodate for this
Not applicable, but would certainly love to hear from colleagues that have implemented [it]
Nothing completely replaces a true internship in a real clinical diagnostic lab.
I would tell them we have no choice but to adapt this method of training. Placements sites are decreasing their intake numbers for clinical training……but want us to increase our numbers because of the shortage now and

coming in the future. The profession needs to catch up in terms of training/education and clinical experience because we will soon be faced with a large problem.
Since we do not have any experience on this subject, we can only imagine. [Translation MG]

Appendix L – Activities in Simulated Laboratories

Respondents reported the following learning activities in their simulated laboratories:

Urinalysis and occult blood testing

- manual and automated dipping, microscopic analysis, pregnancy testing

Chemistry

- glucose, bilirubin, protein, analysis with various analyzers; osmometry, glucometers, data entry, electrophoresis,
- automated analyzers, including the Vitros 250, Integra and Elecsys
- lab math including creatinine clearance calculations,
- urine and serum sample types; manual pipetting techniques; vitamin C; carotene, glucose precision pipetting;
- chromatography techniques (column TLC, two dimension glass, one dimension glass)

Hematology

- differentials and morphologies (normal, abnormal and bone marrow; peripheral smears, bone marrow, CSF & fluid cytospins); smears, blood counts, hemoglobin, coagulation testing, LAP, automated instruments;
- daily maintenance and QC on analyzers
- blood and CSF samples for manual and automated hematology procedures, coagulation, differential microscope work; differentials and morphologies
- manual counting procedures (WBC, PLT, Retics, CSF, fluids);
- special hematology procedures (osmotic fragility, Prussian Blue Fe stain, G6PD Screen, LAP stain, stains for Heinz bodies, Giemsa stain and malaria smears, sickling & solubility tests for HgBs);
- case studies; differentials

Histology

- analysis of tissue
- cutting, staining, microtomy
- special stains, H&E, assessment of staining,
- troubleshooting,
- tissue ID;
- grossing specimens, processing, embedding, sectioning, staining and coverslipping, special stains, microanatomy, microscopy, cryotomy;
- staining (H&E, Trichrome, PAS, GAF, Oil Red O, Gordon & Sweet's)

Transfusion Science

- type, screen, cross-match;
- transfusion reaction investigations, DAT testing;
- antibody identification;
- FMH testing;
- full antibody investigations;

- tagging and issuing;
- pre-transfusion testing;
- any procedure not covered at all sites.

Microbiology

- ID of bacteria;
- culture & sensitivity;
- Gram stain;
- direct smears,
- plating specimens;
- work-up of unknowns from all body sites;
- API identification, tube test identification, spore stain, flagella stain;
- direct smears & cytospins;
- colonial morphology;
- identifying tests;
- safety techniques for Level III labs;
- level II and Level III organisms;

Other activities

- use of LIS for patient entry, test ordering, result entry, delta checks, pending logs, result flagging of criticals;
- quality control;
- phlebotomy;
- lectures and tutorials on special topics;
- stat lab setting: chem, hem, micro, urinalysis, TM;
- multitasking, teamwork, communication and other soft skills;
- workload planning/scheduling; prioritizing workload and re-prioritizing for STAT/priority samples;
- result reporting (critical or stat results; taking phone calls from the physician.