A Model for International Clinical/Biomedical Science Programs

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DECLARATION

I declare that while registered as a candidate for the degree of which this submission is made, I have not been registered as a candidate for any other award. No material contained in this thesis has been used for any other submission for an academic award.

ABSTRACT

This project sought expert consensus regarding the feasibility and substance of international certification and mutual credentialing systems for laboratory professionals. It also examined a potential transatlantic student exchange program for laboratory sciences students. The study addressed key problems confronting the laboratory profession, such as workforce shortages, mobility issues, and the limited number of international study opportunities for clinical/biomedical science students, through an international survey of laboratory program directors. This lead to the development of a transatlantic exchange program between four European and four American partner institutions.

The survey sampled 234 undergraduate clinical laboratory science/medical technology programs accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) in the United States and 46 BSc degree biomedical science courses accredited by the Institute of Biomedical Science (IBMS) across the United Kingdom and Australia, with a response rate of 37.1%. Among other findings, the results indicated that only 10% of programs were currently engaged in international student exchanges but 47% of the respondents expressed an interest in starting student exchange programs and the majority considered international professional certification important and that American and British credentialing agencies should consider mutual credentialing for their program graduates. Based on these findings, a Globalization Task Force was created to explore the feasibility of internationalizing the credentialing process and examine the possibilities for mutual recognition agreements between the United Kingdom, the United States, and Australia.

Following this, a model international clinical/biomedical science student exchange program was designed to expand students' technical skills, foster cross-cultural competencies, and promote a global citizenry.

A course has been chartered for laboratory regulatory and credentialing agencies to bridge the gaps on international harmonization of credentialing standards and credentialing systems for laboratory personnel. By accepting the findings of this project, laboratory stakeholders have many options by which to develop international practice standards and ensure consistency in the quality of laboratory personnel, globally.

DEDICATION

To my mother and husband

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GLOSSARY OF ABBREVIATIONS

AABB	American Association of Blood Banks
ACIIE	American Council on International Intercultural Education
AMT	American Medical Technologist
ANSI	American National Standards Institute
ASCP	American Society for Clinical Pathology
ASCP-BOR	American Society for Clinical Pathology Board of Registry
ASCLS	American Society for Clinical Laboratory Sciences
ASHA	American Speech-Language-Hearing Association
ASHI	American Society of Histocompatibility and Immunogenetics
AIMS	Australian Institute of Medical Science
AURE	Alliance of United Kingdom Regulators on Europe
BMS	Biomedical Scientist
BSc	Bachelor of Science degree
CAAHEP	Commission on Accreditation of Allied Health Education Programs
CAP	College of American Pathologists
CCCLW	Coordinating Council on the Clinical Laboratory Workforce
CGFNS	Commission on Graduates of Foreign Nursing Schools
CHEA	Council for Higher Education
CLIA	Clinical Laboratory Improvement Act

CLMA	Clinical Laboratory Management Association
CLS	Clinical Laboratory Science/Clinical Laboratory Scientist
CMP	Certification Maintenance Program
COHEHRE	Consortium of Institutes of Higher Education in Health and Rehabilitation in Europe
CONAHEC	Consortium of North American Higher Education Collaborators
CPA	Clinical Pathology Accreditation
CPD	Continuing Professional Development
CPSM	Council for Professions Supplementary to Medicine
CSMLS	Canadian Society for Medical Laboratory Science
DHS	Department of Homeland Security
E-MAIL	Electronic Mail
EPBS	European Professions in Biomedical Science
ERASMUS	European Community Action Scheme for Mobility of University Students
EU	European Union
EHPF	European Union Health Policy Forum
FIPSE	Fund for Improvement of Postsecondary Education
GATS	World Trade Organization General Agreement on Trade and Services
GDP	Gross Domestic Product
HPC	Health Professions Council
HQCB	Healthcare Quality Certification Board

IAMLT	International Association of Medical Laboratory Technologists
IBMS	Institute of Biomedical Science
ICD	International Consultants of Delaware
ICE	International Consulting and Educational Service
ICHP	International Commission on Healthcare Professions
IEC	International Electrotechnical Commission
IFBLS	International Federation of Biomedical Laboratory Science
IHWAC	International Health Worker Assistance Center: Welcome Back
IIME	Institute for International Medical Education
INS	Immigration and Naturalization Service
INSPIRED	International Student and Professional Interdisciplinary Research and Educational Development
ISO	International Organization of Standardization
ISP	Internet Service Provider
ISQua	International Society for Quality in Health Care
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
JCIA	Joint Commission International Accreditation
JPU	Jönköping University
KU	Kansas University
LAWBC	Los Angeles Welcome Back Center
MLSO	Medical Laboratory Scientific Officer
MLT	Medical Laboratory Technician
MT	Medical Technology/Medical Technologist

NAACLS	National Accreditation Agency for Clinical Laboratory Sciences
NACNAH	North American Consortium of Nursing and Allied Health
NAFTA	North American Free Trade Agreement
NAIE	National Association of International Educators
NCA	National Certification Agency for Laboratory Personnel
NCCA	National Commission for Certifying Agencies
NHS	National Health Service
NOCA	National Organization for Competency Assessment
SARS	Severe Acute Respiratory Syndrome
TSQ	Temporary Status by Qualification
UCD	University of Cadiz
UCLAN	University of Central Lancashire
UK	United Kingdom
UKY	University of Kentucky
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPR	University of Puerto Rico
US	United States of America
UWV	University of Wolverhampton
WFME	World Federation for Medical Education
WFOT	World Federation of Occupational Therapy
WHO	World Health Organization

TABLE OF CONTENTS

Declaration.....i

Abstract..... ii

Dedication iii

Acknowledgements..... iv

List of Tables and Figures..... v

Glossary of Abbreviations..... vi

Chapter Page

1 INTRODUCTION..... 1
1.1 General Introduction..... 2
1.2 Background..... 13
1.3 Problems addressed in this study..... 27
1.4 Purpose of the study..... 30
1.5 Aims of the Research..... 31

2 METHODS..... 35
2.1 Background..... 36
2.2 The Research Plan..... 37
2.3 The Research Questions..... 38
2.4 The Research Framework..... 39
2.5 Stage One: The Survey..... 41
2.6 The Population and Sampling Frame..... 42
2.7 Pilot test..... 43
2.8 Ethical Approval..... 43
2.9 The Survey Questionnaire..... 44
2.10 Survey Distribution..... 45
2.11 Treatment of the Survey Data..... 46
2.11.1 Step 1: Process of Immersion..... 48
2.11.2 Step 2: Open Coding and Interobserver Reliability..... 49
2.11.3 Step 3: Sorting and Saving..... 49
2.11.4 Step 4: Reporting the Findings..... 49
2.12 Judgmental Validity and Reliability..... 50
2.13 Challenges Associated With Data Analysis..... 51
2.14 Limitations of the Survey..... 51

3 DEVELOPMENT OF SURVEY..... 53

3.1 The Survey Research Method 54
3.2 The Survey Rationale 55
3.3 Ethical Approval 56
3.4 The Pilot Study 56
3.5 Construction of the Cover Letter 57
3.6 Construction of the Questionnaire 58
3.7 Characteristics of the Questions 59
3.8 Survey Distribution and Follow-Up 66

4 RESULTS 68
4.1 Introduction 69
4.2 Verification of Information 69
4.3 Response Rates 71
4.4 Demographic Information 77
4.5 Response Rates by US Geographic Regions 79
4.6 Categorical Response Rates from the UK and Australia 79
4.7 Student Enrollments 81
4.8 Existing Program Information 81
4.9 International Exchange Program Information 86
4.10 Financial Aid 89
4.11 Accommodation 90
4.12 Transatlantic Exchange Information 92
4.13 Program Components 94
4.14 Student Assessment and Selection Criteria 97
4.15 Factors for a Successful Exchange 100
4.16 Basic Student Skills 102
4.17 Institutional Barriers 107
4.18 Student Barriers 107
4.19 International Professional Certification 112
4.20 Eligibility Requirements for International Professional Certification 115
4.21 Mutual Credentialing 119
4.22 Level of Interest in Starting International Exchanges 123
4.23 Other Comments/Suggestions 123

5 EVALUATION OF SURVEY RESULTS 129
5.1 Description of the sample 130
5.2 Response Rates 130
5.3 Responses by Region and Country 132
5.4 Factors Influencing Response Rate 132
5.5 Survey Instrumentation 133
5.6 Program Enrollment 134
5.7 Transatlantic Exchange Program 135
5.8 The Research Questions 138
5.9 Summary 144

6 CONCLUSIONS 146

6.1 Introduction 147
6.1.1 Research Question One 147
6.1.2 Research Question Two 149
6.1.3 Research Question Three 151
6.1.4 Research Question Four 152
6.2 Anecdotal Information 153
6.3 Healthcare and Laboratory Services in the United Kingdom and the United States 156
6.3.1 Healthcare Trends in the United Kingdom 156
6.3.2 Healthcare Trends in the United States 157
6.4 Current Trends Affecting Laboratory Professionals in the United Kingdom and the United States 157
6.5 Laboratory Workforce Trends and Projections in the United Kingdom and the United States 158
6.5.1. The Laboratory Personnel Shortage in the United Kingdom 159
6.5.2. The Laboratory Personnel Shortage in the United States 159
6.6 Recent Strategies to Ameliorate the Laboratory Personnel Shortage in Both Countries 160
6.7 The Changing Landscape of Higher Education in the United Kingdom and the United States 161
6.8 Current Trends in Competency Assessment in the United Kingdom and the United States 164
6.9 Competency Assessment in the Workplace in the United Kingdom and the United States 165
6.10 Trends in Continuing Professional Development in the United Kingdom and the United States 167
6.11 Regulations and Standards in the United Kingdom and the United States 169
6.12 Mobility of Laboratory Professionals in the United States and Europe 173
6.13 Outcomes from Multinational Forums 175
6.14 New Horizons 176
6.15 Conclusion 177

7 DEVELOPMENT OF AN INTERNATIONAL MODEL PROGRAM FOR LABORATORY SCIENCES 181

7.1 State Two: The Impetus for a Transatlantic Exchange Program 182
7.2 Background Information 184
7.3 Participating Partner Institutions 188
7.4 The American Partnership 189
7.5 The European Community Partnership 191
7.6 Specific contributions of the partner institutions 191
7.6.1 University of Kentucky, College of Health Sciences 192
7.6.2 Kansas University Medical Center, School of Allied Health 192
7.6.3 University of Puerto Rico, Medical Science Campus 193

7.6.4 University of Alabama, School of Allied Health..... 193
7.7 Specific contributions of Partners from the European Community... 194
7.7.1 University of Central Lancashire, Faculty of Science..... 194
7.7.2 University of Wolverhampton, School of Applied Sciences... 194
7.7.3 University of Cadiz, Program in Biomedical Sciences..... 194
7.7.4 Jönköping University, School of Health Sciences..... 195
7.8 Exchange Program Goals..... 196
7.9 Exchange Program Objectives..... 196
7.10 Aims of the Exchange Program..... 197
7.11 Student expectations..... 198
7.12 The Proposed Exchange Model..... 199
7.13 Multilateral Collaboration..... 200
7.14 Student Prerequisites..... 201
7.15 Student Preparedness..... 201
7.16 Program Evaluation and Sustainability 203
7.17 The Evaluation Process..... 204
7.18 The Evaluation Plan..... 205
7.19 Program Sustainability..... 207
7.20 Summary..... 208

REFERENCES AND BIBLIOGRAPHY..... 210

APPENDICES

List of Tables and Figures

Tables		Page
1.1	Select List of Organizations and Associations That Foster Transnational Healthcare Programs	7
4.1	Categorical Survey Response Rates	76
4.2	Demographic Data by Country	78
4.3	Categorical Response Rates by US Geographic Regions	80
4.4	Survey Responses by Non-US Regions	83
4.5	CLS/MT and BMS Programs Participating in International Education Exchanges	86
4.6	International Exchanges by Location, Participants and Length of Stay	87
4.7	Types of Student Financial Aid	89
4.8	Considerations for a Transatlantic Exchange Program	93
4.9	Frequency of Program Components	95
4.10	Categories/Major Themes for Program Components and Salient Points	97
4.11	Frequency of Student Assessment and Selection Criteria	99
4.12	Categories/Major Themes for Student Assessment and Selection Criteria and Salient Points	100
4.13	Frequency of Factors Needed for a Successful Exchange Program	103
4.14	Categories/Major Themes for Factors Needed for a Successful Exchange Program and Salient Points	104
4.15	Frequency of Basic Student Skills	105
4.16	Categories/Major Themes for Student Skills and Salient Points	108
4.17	Frequency of Institutional Barriers	110
4.18	Thematic Analysis of Institutional Barriers and Salient Points	111
4.19	Frequency of Student Barriers	114
4.20	Categories/Major Themes for Student Barriers and Salient Points	114
4.21	Respondents For and Against International Professional Certification	115

4.22	Categories/Major Themes in Favor of International Professional Certification and Salient Points	116
4.23	Categories/Major Themes in Opposition to International Professional Certification and Salient Points	117
4.24	Eligibility Requirements for International Professional Certification	118
4.25	Categories/Major Themes for Eligibility Requirements and Salient Points	121
4.26	Respondents Positions Regarding Mutual Credentialing	122
4.27	Categories/Major Themes for Accomplishing Mutual Credentialing and Salient Points	124
4.28	Respondents Positions on Starting an International Exchange Program	125
4.29	Categories/Themes for Starting an International Exchange Program	126
4.30	Categories/Major Themes for Other Comments, Suggestions, and Salient Points	127
6.1	List of Presentations and Participation at Professional Conferences	
7.1	Laboratory Certifications Offered by the American Society for Clinical Pathology Board of Registry	184
Figures		
4.1	Bar Graph Depicting Survey Distribution	70
4.2	Initial Response and Subsequent Responses to Survey Reminders	73
4.3	Bar Graph Depicting Number of Responses by Program Type	74
4.4	Bar Graph Depicting Categorical Survey Response Rates	75
4.5	Bar Graph Depicting the Combined Student Enrollments in United States, United Kingdom, and Australian Programs	84
4.6	Bar Graph Depicting the Average Number of Students/Per Program Among The Clinical/Biomedical Science Programs	85
4.7	Faculty/Staff and Student Participation in International Exchange Programs	88
4.8	Bar Graph Depicting Programs That Offer Financial Aid and Housing Accommodations	91

4.9	Bar Graph Depicting Rating Scale of Program Components	96
4.10	Bar Graph Depicting Average Rating for Student Assessment and Selection Criteria	98
4.11	Bar Graph Depicting Average Rating of Factors for a Successful Exchange	101
4.12	Bar Graph Depicting Average Ratings	106
4.13	Bar Graph Depicting Average Ratings for Perceived Institutional Barriers	109
4.14	Bar Graph Depicting Average Ratings for Perceived Student Barriers	113
4.15	Bar Graph Depicting Responses for Professional Qualifications	120
7.1	Illustration of the Transatlantic Model Partnership for Clinical/Biomedical Sciences	188

Chapter 1

INTRODUCTION

1.1 General Introduction

Current rates of international mobility of doctors, nurses, and other health professionals are rising, and suggest a need for an urgent consideration of creating standards of practice and licensure across international boundaries. Should this migratory pattern continue, an immediate standard of practice will be required to assure quality international standards for educating and training healthcare professionals available to staff services. Goldsmith (2002) suggests that workforce mobility increases the need for systems that promote the transnational use of qualified health professionals and services. Goldsmith further points out that transnational standards addressing the education and credentialing of health professionals are a vital component of such systems (Goldsmith, 2002). Currently, there is no global system that provides a clear international standard of content or international accreditation for medical education (Hamilton, 2000). In the case of the laboratory profession, legislative regulations at the national and international levels have developed in the last two decades, such as International Organization of Standardization (ISO) and the International Electrotechnical Commission (IEC) standards supported by recommendations of laboratory professional societies (Haeckel and Kindler, 1999). ISO and IEC form the specialized system for standardization, worldwide. According to the ISO and IEC definition, a standard is "a document established by consensus and approved by a recognized body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results aimed at achieving the optimum degree of order" (S. Goldsmith, personal communication, October 19, 2003). For example, ISO 15189 is an internationally recognized standard for quality

management in the medical laboratory for use by accreditation bodies that recognize the competence of clinical laboratories (Kenny, 2001; Burnett and Blair, 2001). As Burnett and Blair state, ISO15189 is a significant step towards harmonization of medical laboratory practice, but it also brings to light new issues as to how it will be used or interpreted in different countries (Burnett and Blair, 2001). In 2001, ISO and the International Electrotechnical Commission (IEC) introduced the ISO/IEC 17024 Standard with the objective of achieving and promoting a globally acceptable benchmark for organizations operating certification of individuals. The American National Standards Institute (ANSI) has oversight for the voluntary standardization and compliance assessment system for the United States (www.ansi.org). In the United States, organizations that validate compliance of the competence of individuals against specific requirements are called "certification" agencies. In other countries, certification agencies are referred to as "registration and assessment bodies" and or "registrars." More than twelve United States organizations certify laboratory professionals in the United States (Trotto, 1991). For clarification, the American Society for Clinical Pathology is a "certification" body for laboratory professionals and the National Accreditation Agency for Clinical Laboratory Sciences (NAACLS) is the accreditation body for the laboratory profession in the United States. In the United Kingdom, the Institute of Biomedical Science (IBMS) is a professional body that registers laboratory professionals.

With cross-border trade in services accounting for more than 20% of world trade, the trend toward globalization is seen in almost every sector and exposes many professions, including the health professions, to new competitive arenas (S. Goldsmith, personal communication, October 19, 2003). In some instances, professional groups are initiating

bilateral and multilateral agreements to foster mobility for their professionals. Globalization trends have led to discussions by select health professions on the need to develop standards for international professional certification. For example, national and international standards have been introduced for select health professions and hospitals, following international agreements in the mid 1990s, such as the North American Free Trade Agreement (NAFTA) that marked its tenth anniversary on 1 January 2004 and the World Trade Organization Agreement on Trade in Services (GATS). NAFTA is an agreement between the governments of Canada, Mexico and the United States that resolves to strengthen their bonds of friendship and cooperation to contribute to the harmonious development and expansion of world trade, and to provide a catalyst for broader international cooperation, among other considerations. GATS is an international trade agreement that has operated under the aegis of the World Trade Organization since 1995. The GATS aim is to gradually remove all barriers to trade in services such as banking, education, healthcare, and tourism. Although educational requirements or standards for the health professions are not specifically mentioned in the NAFTA agreement, NAFTA does provide a context and rationale for the North American governments to remove barriers that limit the flow of scholars, students, academic ideas, projects and professional practices across borders in North America.

Specifically, public health higher education is subject to NAFTA provisions in the following four areas: licensure and certification, labor provisions, trade and services across borders, and intellectual property rights (Collins, 2002). First and foremost, the new international Joint Commission for accreditation of healthcare organizations established a comprehensive set of international quality standards for hospitals (Joint

Commission, 2001). The Joint Commission International Accreditation (JCIA) is a body of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) designed to offer the international community a standards-based, objective process for evaluating healthcare organizations. JCAHO is an independent, non-profit organization that evaluates and accredits over 16,000 health care organizations and programs in the United States. JCAHO is the preeminent standards-setting and accrediting body in US healthcare (www.jcaho.org). The JCIA standards, based on principles for healthcare quality, were developed by the International Society for Quality in Health Care and were field tested during accreditation surveys in Western Europe, the Middle East, and Latin America (Moore, 1998). The International Society for Quality in Health Care (ISQua) is an independent, non-profit organization with members in over 70 countries, striving to provide services to guide healthcare professionals, researchers, health policy makers, and healthcare providers to achieve excellence in, and to improve quality and safety of care for, healthcare delivery to all peoples. ISQua headquarters are located in Melbourne, Australia (www.isqua.org.au).

Secondly, complementary initiatives by international organizations, such as the Institute for International Medical Education, the World Federation for Medical Education, and the World Health Organization, have focused on global minimum essential requirements for the content of undergraduate medical curricula (Hamilton, 2000). The Institute for International Medical Education (IIME), established in 1999, has been committed to develop global minimum essential core requirements to be required by physicians worldwide and to collect global information on different aspects of education of the medical profession (www.iime.org). The World Federation for Medical Education

(WFME) is a global organization concerned with the education and training of physicians (www.ifmsa.org/partners/wfme.htm). The World Health Organization (WHO), established in 1948, is the United Nations' specialized agency for health. WHO's aim is that all peoples of the world attain the highest possible levels of health, defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (www.who.int). The IIME, established in 1999, was entrusted with the development of global standards and minimum core requirements for medical school curricula to help provide graduates, regardless of where they are educated, with essential competencies, attitudes, behaviors, knowledge, and skills (Wojtczak and Schwarz, 2000). No institution can claim a legally established mandate to set up a global system for medical and health sciences education; not the IIME focusing on curricular content, nor WFME geared toward accreditation of medical schools, and not WHO which promotes quality assurance standards for doctors moving between countries.

Thirdly, health telepractice activities intensified in the 1980s and 1990s and attracted the attention of governments and health care industries in the United States and Europe. Telepractice, the use of various electronic and informational tools by professionals to deliver their services over long distances, raises the critical issue of where practitioners of one country need to be certified or licensed if they want to practice their profession in another country(www.clearng.org/teleguide.htm). This issue fuels interest in transnational standards of quality for health care professionals.

Although some health professions and countries are neither willing nor able to engage in international certification and accreditation agreements, there are health –related organizations and professional associations that attest to the need for having transnational

programs of quality assurance in higher education. Important considerations for determining the feasibility of societies to develop an international credentialing agreement include, but are not limited to: 1) a lack of desire among stakeholders to develop agreements; 2) differences in the way professions are defined; 3) differences in scope of practice, levels of autonomy and practice patterns; 4) national or state licensing regulations; and 5) prevailing immigration laws and regulations (Goldsmith, 2002). In addition, differences in culture and language affect significantly the development of international cooperative agreements, and provisions for language and cultural preparation among participating partners need to be considered to address these differences. Table 1.1 provides a partial list of organizations and associations that are involved in either the establishment or investigation of transnational healthcare programs.

The American Society for Clinical Pathology (ASCP) is a non-profit medical society for professionals in the fields of laboratory medicine and pathology. The ASCP membership includes 11,000 pathologists and other physicians and over 129,000 laboratory professionals (www.ascp.org). Initiated in 1928, The American Society for Clinical Pathology Board of Registry (ASCP-BOR) is a separate certifying body within the organizational structure of ASCP. The ASCP-BOR promotes the health and safety of the public by certifying competent laboratory professionals and maintaining a register of certificants in the United States (www.ascpbor.org). Currently, there are approximately 265,000 medical laboratory

Table 1.1 Select List of Organizations and Associations That Foster Transnational Healthcare Programs

ORGANIZATION	ABBREVIATION	DESCRIPTION	URL ADDRESS
American Society for Clinical Pathology Board of Registry	ASCP-BOR	Premier US agency certifies medical lab science personnel	www.ascpbor.org
Association of Speech & Language Pathology	ASHA	US professional & credentialing agency for audiologists & speech-language pathologists	www.asha.org
Council for Higher Education	CHEA	Approves US accreditation agencies, along with Dept. of Education	www.chea.org
Consortium of Institutes of Higher Ed in Health & Rehab in Europe	COHEHRE	Interdisciplinary health professions org. of higher ed institutional members in EC. Headquarters Belgium	www.cohehre.org
International Commission on Healthcare Professions	ICHP	Division of Commission on Graduates of Foreign Nursing Schools. Conducts visa credential assessments for nursing and select allied health professions	www.cgfns.org
International Federation of Biomedical Laboratory Sciences	IFBLS	International professional organization with laboratory associations from 40 countries	www.ifbls.org
National Accreditation Agency for Clinical Lab Sciences	NAACLS	Premier agency that accredits clinical lab/med tech programs in US & overseas	www.naacls.org
New Alliances Consortium of Nursing & Allied Health	NACNAH	Interdisciplinary health professions org with members from US, Canada, Mexico & Europe	www.pace.edu/nacnah
Welcome Back: Int'l Health Worker Assistance Center	Welcome Back	Center provides education and support services to international trained healthcare workers in CA	www.e-welcomeback.org
World Federation of Occupational Therapy	WFOT	Premier agency that accredits Occupational Therapy programs	www.wfot.org

The above table lists organizations relevant to fostering transnational healthcare programs, with their corresponding abbreviations and details of their bases of operations. The organizations will be commonly referred to by their abbreviations in the text of this thesis, and more details of their organizational functions are described in section 1.1

professionals and 15,000 board certified pathologists in the United States.

The American Speech-Language-Hearing Association (ASHA) is the scientific, professional, and credentialing association representing almost 100,000 audiologists and speech-language pathologists in the United States (www.asha.org). The field of audiology dates back to the 1920s. The Council for Higher Education (CHEA), along with the Department of Education, approves accreditation agencies in the United States. CHEA is the sole coordinating organization for United States accreditation, quality assurance and quality improvement of higher education. CHEA is a national, private, non-profit, membership organization of 3,000 degree-granting universities and colleges and 60 institutional and programmatic accreditors (www.chea.org).

The Consortium of Institutes of Higher Education in Health & Rehabilitation in Europe (COHEHRE) was established in 1990 in Gent, Belgium. COHEHRE, supported by the European Commission and within the framework of the Erasmus program, is an interdisciplinary health professions organization comprised of 39 higher education institution members in 15 European countries that are concerned with healthcare and rehabilitation, and provides a forum for information exchange and cooperation within the European Community (www.cohehre.org). The International Commission on Healthcare Professions (ICHP) is a division of the Commission on Graduates of Foreign Nursing Schools (CGFNS) that was created in 1996. CGFNS was founded in 1997 through a joint effort by representatives from the Immigration and Naturalization Service (INS); the United States Department of Health, Education and Welfare, now called the Department of Health and Human Services; the United States Department of Labor; and several nursing organizations. ICHP conducts visa credential assessments for nursing and some

allied health professions to ensure compliance with the United States government's minimum eligibility standards for certain occupational visas (www.cgfns.org; International Commission on Healthcare Professions and Commission on Graduates of Foreign Nursing Schools, 2001).

The International Federation of Biomedical Laboratory Science (IFBLS) is an independent, global organization, founded in 1954 under the name of the International Association of Medical Laboratory Technologists (IAMLT). IFBLS consists of associations of clinical/biomedical laboratory scientists from 40 countries, and promotes the development of laboratory professionals through education and partnership. IFBLS acts as a non-governmental agency in an official relationship with the World Health Organization (WHO) and the United Nations (www.ifbls.org).

The National Accreditation Agency for Clinical Laboratory Sciences (NAACLS) is the premier international agency for accreditation and approval of educational programs in the clinical laboratory sciences and health-related professions in the United States and overseas. NAACLS' Medical Technology committee dates back to 1974 (www.naacls.org). Established in 1993, the New Alliances Consortium of Nursing and Allied Health (NACNAH) is an interdisciplinary health professions organization for international cooperation with institutional and individual members from the United States, Canada, and Mexico (www.pace.edu/nacnah).

In 2000, the Mt. San Antonio College, Regional Health Occupation Resource Center launched the "Welcome Back" International Health Worker Assistance Center, located on their college campus. "Welcome Back" seeks to bridge the gap between the need for linguistically and culturally competent healthcare workers and the underutilized pool of

internationally trained healthcare workers residing in California (www.e-welcomeback.org). Founded in 1952, The World Federation of Occupational Therapy (WFOT) is the official international organization that accredits educational Occupational Therapy programs and promotes occupational therapy and occupational therapists, worldwide (www.wfot.org).

It should be noted that educational institutions with occupational therapy programs in 57 member associations worldwide have agreed to abide by WFOT accreditation standards. If over fifty countries can agree on uniform accreditation standards for occupational therapy, then an important question arises as to the feasibility of other allied health professions adopting transnational standards. The answer to this question is complex for a variety of reasons. Firstly, common international standards are usually developed by an international body composed of representatives from a variety of countries that develop country-neutral education or certification standards (Goldsmith, 2002). Secondly, international standards typically serve only as guidelines and so participating countries need not abide by them. Thirdly, whereas standards usually address profession-specific course content, they do not mandate the level or scope of education outside the professional arena.

Goldsmith (2002) addresses the feasibility of developing an international credentialing program and provides an example of an initiative entitled "The Millennium Intent," a process by which an agreement was negotiated between non-governmental national certification agencies in Australia, Canada, the United Kingdom, and the United States for mutual recognition of professional education and credentials for speech-language pathology. The accord negotiated via the "Millennium Intent" process provides a

mechanism for individuals credentialed by any of the speech-language pathology organizations within the participating countries to be certified and licensed as speech-language pathologists by the other participating organizations.

The "Millennium Intent" initiative could serve as a model for member countries of the International Federation of Biomedical Laboratory Sciences. Medical/clinical/biomedical laboratory science is the third largest profession of the health care professions worldwide, and over 180,000 laboratory professionals are affiliated with IFBLS through member organizations. Although IFBLS does not currently have a policy on international standards for biomedical laboratory scientists, should IFBLS develop such standards for education and training needed to become an internationally certified clinical/biomedical laboratory scientist, it could benefit education systems and health care services of participating member countries by: promoting the portability of qualified laboratory workers; providing a global healthcare perspective; increasing sensitivity to cross-cultural perspectives; providing meaningful student/faculty exchanges between participating educational partners; developing and disseminating best practices internationally; promoting international research and collaboration; improving access to laboratory services for qualified laboratory professionals educated in another country; and encouraging English language proficiency, the official language of the Association. Celebrating its 50th anniversary, IFBLS will convene their 26thWorld Congress in June 2004 in Stockholm, Sweden (www.vardforbundet.se/ifbls2004) and, following personal discussions with this author, the President of IFBLS has agreed to place the topic of international professional certification for CLS/BMS on the General Assembly of Delegates' agenda of the 2004 World Congress (N. White, personal communication, July

16, 2003). To the best of my knowledge, this will be the first time in IFBLS 50 year history, that international professional certification for clinical/biomedical laboratory scientists will be formally introduced at an IFBLS World Congress. This suggests to me that the IFBLS President has placed significant importance on, and belief in, this author's research.

1.2 Background

Since the development of the laboratory profession in the 1920s in the United States, clinical laboratory scientists/medical technologists have contributed significantly to the diagnosis, treatment, and monitoring of disease, as well as to biomedical research and disease prevention. In the United States, a clinical laboratory scientist (CLS), also known as a medical technologist (MT), performs and/or supervises the performance of clinical laboratory testing in the general or specialized areas of clinical hematology, clinical chemistry, medical microbiology, immunohematology or blood banking, immunology, serology, and clinical microscopy. Data collected in clinical laboratories are correlated to pathophysiology and used by clinicians in the diagnosis, treatment, monitoring and prevention of disease. CLS/MT personnel may also be involved in medical laboratory research and development activities. The minimum education and training requirements for a clinical laboratory scientist/medical technologist are a Bachelor's degree and 6 to12 months of training in the laboratory disciplines of clinical chemistry, hematology, immunology, immunohematology, and medical microbiology. Upon successful completion of an approved Bachelor's degree CLS or MT program, graduates are eligible to take a national registry examination and a licensure examination, regulated by

individual states. Not all states in the United States require licensure for clinical laboratory scientists/medical technologists. Master's and doctoral degree programs in Clinical Laboratory Sciences are currently available in the United States and abroad. These advanced degree programs are designed for those who wish to continue in their careers as laboratorians and at the same time take advantage of personal and professional development opportunities to expand their role in the areas of management, education, and biomedical research.

Throughout its history of more than seventy- five years the laboratory profession has been faced with many challenges and rapid changes. For example, laboratory personnel have had to learn how to operate highly sophisticated and advanced instrumentation; they were involved with research and development of new diagnostic technologies, and they witnessed the evolution of complex laboratory information systems. During this period, the laboratory profession also experienced acute, cyclic workforce shortages. The most recent shortage affecting the declining clinical laboratory workforce has prevailed since the 1990s, and has become chronic and severe to the point of crisis. To illustrate the current shortage, data collected by the American Society for Clinical Pathology-Board of Registry during the 2000 Wage and Vacancy Survey of Medical Laboratories in the United States for the year 2000 evidenced the highest vacancy rates reported throughout a 12-year comparison period for 5 of 10 major laboratory staff positions (Ward Cook and Tanner, 2001). Many factors have been identified which contribute to the prevailing lab workforce saga. These include, but are not limited to, the following: an aging workforce, where the mean age of certified MTs is 47; job dissatisfaction; poor morale; high levels of stress in the workplace; risk of infection; lack of career advancement; lack of

recognition by other healthcare associates and the public; and salaries that linger behind those of other health professions such as Nursing and Pharmacy (Ward-Cook, Nov/Dec 2002).

In the United Kingdom, similar laboratory workforce shortages and comparable problems have been reported by the Institute of Biomedical Science (IBMS), the professional body for biomedical scientists, including medical laboratory scientific officers, in the National Health Service (NHS) and related services throughout the United Kingdom and in Ireland (www.ibms.org). Founded in 1912, IBMS celebrated its 90th anniversary in 2002 and is the oldest pathology professional body in Europe. In the *Institute of Biomedical Science Annual Report 2002*, IBMS reported workforce-related problems such as recruitment and retention due to poor salary structure and poor morale that have led to workforce instability (www.ibms.org). In 2002, the *Agenda For Change*, a vehicle for achieving massive changes in NHS pay and job conditions, proposed pay bandings of £17,000 for the state registration salary level, a significant improvement over current levels. As the United Kingdom Health Secretary Alan Milburn put it, "*Agenda for Change* is the most radical modernization of the NHS pay system since its foundation in 1948" (www.doh.gov.uk/agendaforchange).

An indication of the magnitude of the laboratory shortage problem in the United Kingdom was given in a report by Crowther-Cottam (2001) from the Northwest Midlands region of England, in which a short reference to this thesis was included in the "International Recruitment" section. Also cited in this report were the comments of the Chief Nursing Officer, who stated that "international recruitment by the NHS organization has made a key contribution to the delivery of high quality clinical services-

especially in areas where recruitment has proved to be difficult. The NHS has a long history of welcoming staff from abroad to gain experience and education by working in our hospitals" (Crowther-Cottam, 2001). Unfortunately, laboratory workers from abroad have not had the same opportunity to benefit from international recruitment as nurses, yet they play a vital role in NHS pathology laboratory services.

In response to the severity of the American and British laboratory workforce shortage, healthcare providers, academic institutions, and stakeholders of laboratory related organizations are currently examining whether experienced foreign certified/registered laboratory workers could add to the employment pool and possibly help ameliorate the common challenges of delivering laboratory services by recruiting qualified laboratorians outside the United States and United Kingdom (Crowther-Cottam, 2001).

Although common international professional standards for clinical laboratory/biomedical scientists do not currently exist, the doors have been partly opened by the following United States credentialing agencies mentioned previously: the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and the American Society for Clinical Pathology (ASCP). Both of these groups recognize the shifting global demands placed on the laboratory profession by the widespread use of laboratory based advanced technologies, and the severe workforce shortage of qualified laboratory personnel. That said, some type of reciprocity between United Kingdom and United States certification bodies could generate alternatives to current certification models and new certification schemes are needed in order to respond to the challenges and demands of a global marketplace of the future, for which laboratory professionals must be trained and qualified for work. Personnel certification is a means of providing assurance to

employers and consumers that a certified person has demonstrated the knowledge and skills needed to perform competently in the occupation in which she or he holds professional certification.

Over the past decade, evidence of a growing interest in international standards for allied health professionals has emerged from state and national legislation, and from private and public stakeholders of professional certification, in the United States and overseas. Government officials, employers and consumers at the national and international levels have given more attention to the need for developing and sustaining a highly skilled, global healthcare workforce. Examples of the increasing interest in international health professions standards include, but are not limited to: the Illegal Immigration Reform and Immigrant Responsibility Act; the VisaScreen™ program, and the Temporary Status by Qualification (TSQ) credential. Furthermore, international standards such as ISO/IEC 17024 have also emerged with the primary objective of achieving and promoting a globally acceptable benchmark for certification/registration bodies and those personnel who are certified and/or registered by them. A brief discussion of the United States legislation, VisaScreen™, and the TSQ credential, and ISO/IEC 17024 is given below.

The Illegal Immigration Reform and Immigrant Responsibility Act, an American Immigration law enacted in 1996, requires that healthcare professionals, other than physicians, complete an authorized visa screening program in order to qualify for select occupational visas. In 1999, under the provisions of this law, the Commission on Graduates of Foreign Nursing Schools was authorized by the Immigration and Naturalization Service (INS) to issue VisaScreen™ program certificates to Medical

Technologists/Clinical Laboratory Scientists and Medical Laboratory Technicians/Clinical Laboratory Technicians, Physical and Occupational Therapists, Physician's Assistants, and Speech Language Pathologists trained overseas who request employment in the United States. The Commission on Graduates of Foreign Nursing Schools (CGFNS) is an organization with divisions of: the International Commission on Healthcare Professions (ICHP), the International Consulting and Educational Service (ICE), and the International Consultants of Delaware, Inc. (ICD), which provides internationally-educated health professionals with high quality service that facilitates success with the United States Immigration Service and licensing boards (www.cgfns.org). Certificates, issued through the VisaScreen™ program, certify the education, training, licensure (where applicable), professional work experience, and English language proficiency of international applicants. Foreign applicants in designated professions who are seeking permanent resident status must meet all requirements of the federal immigration law. To implement the VisaScreen™ program, CGFNS established the International Commission on Healthcare Professions (ICHP) with separate committees from each of the aforementioned professions to draft, field test and recommend the standards to be used in the VisaScreen™ program. ICHP conducts visa credential assessments for nursing and select allied health professions to ensure compliance with the government's minimum eligibility standards for certain occupational visas. Each committee consisted of representatives from the regulatory and practice sectors of the professions, as well as a university admissions administrator. A copy of the VisaScreen™ application is available on-line at the CGFNS website (www.cgfns.org).

The Medical Technologist and the Medical Laboratory Technician Professional Standards were developed by ICHP in 1998, and approved by the CGFNS/ICHP Board of Trustees in 1999. A copy of the Medical Technologist and Medical Laboratory Technician standards can be obtained from CGFNS, with permission from the executive director of CGFNS. Under the ICHP standards, an individual seeking to come to the United States to work as a clinical laboratory scientist/medical technologist would be required to have a baccalaureate degree, have completed an approved or accredited university-level structured training program of a minimum of one year, and pass an examination, assuming a licensure or certification examination is offered in the country of origin.

In the United States and Canada, published standards of practice and competencies expected of entry-level CLSs/MTs are posted on the websites of the American Society for Clinical Laboratory Science (www.ascls.org/position/personnel) and the Canadian Society for Medical Laboratory Science, respectively (www.csmls.org/english/standards.htm). The American Society for Clinical Laboratory Sciences (ASCLS) is a premier organization for clinical laboratory science practitioners that provide leadership to promote all aspects of clinical laboratory science education, practice, and management (www.ascls.org).

Canadian national medical laboratory technologist standards of practice consist of the following seven categories: knowledge, safe practices in the workplace, data and specimen collection and processing, analytic techniques and instrumentation, interpretation and reporting of test results, principles of quality management, and professional conduct. The Canadian Society for Medical Laboratory Science (CSMLS),

the certification agency for Canada, developed a "Competency Profile" and posted competencies of an entry-level medical laboratory technologist.. These competencies are available on the CLMS website (www.csmls.org). The "Competency Profile" focuses on the essential knowledge, attitudes, judgment and skills needed by an entry-level medical technologist for optimum laboratory performance. The "Competency Profile" consists of six categories: workplace safety practices, data collection and processing, specimen analysis and validation of results, analytical techniques, interpretation and reporting of results, and quality management. Since 1999, the Canadian certification examination has focused on competencies and outcomes. To assist the CSMLS in evaluating the knowledge and experience of foreign-trained medical laboratory technologists, a "Personal Competency Rating" evaluation form was developed by the society and posted on the CSMLS website (www.csmls.org).

The Institute of Biomedical Science's Professional Code of Practice sets the standards of practice by which providers of a pathology service abide. It is a statutory requirement that biomedical scientists working in the NHS or providing a service to the NHS must be state registered. State registration places IBMS at the center of developing education, training, and laboratory professional standards. Under the IBMS standards, to be state registered a biomedical scientist must first possess an honors science degree accredited by the Institute and then complete a minimum of one year of in-service training, under the supervision of a registered training officer, at a laboratory approved by the Health Professions Council (HPC). On 1 April 2002, the Health Professions Council (HPC) became the state registration body that replaced the Council for Professions Supplementary to Medicine (CPSM) (www.hpc-uk.org). Prior to 1 July 2002, the

responsibility for issuing certificates of competence to biomedical scientists rested with the Medical Laboratory Technology Board of the former CPSM. However, the Institute now has the right to decide on professional competence of biomedical scientists. Biomedical scientists who wish to be employed in a biomedical or pathology laboratory as a Medical Laboratory Scientific Officer (MLSO) must be registered by the HPC. In addition to MLSOs, the HPC also regulates other health professions, such as speech and language therapists, prosthetists & orthotists, chiropodists/podiatrists, and occupational therapists, among others (www.hpc-uk.org).

There are currently over 21,000 MLSO registrants in the United Kingdom. The Institute maintains a central office in London with regional and branch networks throughout the United Kingdom and has accredited university biomedical science courses in other countries including Hong Kong, Malaysia, Australia, Sri Lanka, Malta, and Ireland. IBMS has also taken on the new role of assessing overseas applications for entry to the biomedical scientists' register, on behalf of the HPC (Potter, 2003). Eligibility requirements for registration include the following: graduation from an IBMS-approved honors science degree course from a university; successful completion of one or two years of training in an approved laboratory discipline; completion of the relevant training record; and passage of the relevant examination.

Globalized standards for certified personnel, including health care professionals, were launched in 2002 by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Together they proposed the global standard for personnel certification organizations known as ISO/IEC 17024 (www.iso.org). ISO and IEC form the specialized system for worldwide standardization.

This standard could be the basis for the recognition of certification/registration bodies and their certification schemes to facilitate their acceptance nationally and internationally. The final draft of the ISO/IEC 17024 standard was presented and reviewed by Forum participants, of which this researcher was one, at an Open Forum sponsored by the American National Standards Institute (ANSI) in Washington, DC. ANSI continues to create the benchmark of excellence in American voluntary standardization and conformity assessment systems since 1918 and is the only United States representative and member of the ISO and IEC (www.ansi.org).

The American credentialing process for medical technologists/clinical laboratory scientists includes national certification and state licensure, where applicable. There are currently 11 states in the United States with laboratory personnel licensure. These states are California, Hawaii, Florida, North Dakota, Rhode Island, Tennessee, Louisiana, Nevada, West Virginia, Montana, and Georgia. Puerto Rico, a United States commonwealth, also has licensure. Several eligibility routes for Clinical Laboratory Scientist (CLS) or Medical Technologist (MT) certification are available to candidates who have an undergraduate degree in clinical laboratory science/medical technology or equivalent from a college or university accredited by an agency recognized by the United States Department of Education, approved by an American state governmental agency, or recognized by an agency of the Canadian government (if applicable). The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and the Commission on Accreditation of Allied Health Education Programs (CAAHEP) are the non-governmental accreditation agencies for laboratory science and allied health programs, respectively.

In 2001, NAACLS opened their accreditation process to include laboratory programs located in institutions outside of the United States. The procedures for the accreditation process for international programs are identical to the steps accrediting American programs (www.naacls.org). Established in 1994, CAAHEP accredits programs representing over twenty allied health disciplines such as Cytotechnology, Respiratory Therapy, Surgical Technology, Cardiovascular Technology, and Medical Illustrator, among others (www.caahep.org).

The following three non-governmental American credentialing bodies offer national and or international certification, by examination, for graduates of NAACLS-approved education programs: the American Society for Clinical Pathology - Board of Registry (ASCP-BOR), the National Certification Agency for Laboratory Personnel (NCA), and the American Medical Technologist (AMT). The Board of Registry "promotes the health and safety of the public by certifying competent laboratory professionals and maintaining a registry of certificants" (www.ascpbor.org) and has certified laboratorians since 1928. As of June 2003, the ASCP-BOR has certified 392,016 laboratorians in over twenty individual categories (American Society for Clinical Pathology Board of Registry, 2003). The ASCP-BOR also provides continuing education programs for laboratory professionals at the local, regional, and national levels. To be eligible to take the certification examination, individuals need to meet the ASCP requirements for the selected examination route and provide supporting documentation of their education, training, and laboratory employment history. In 2002, the Board of Governors of the ASCP-BOR approved the Globalization Task Force in order to move their international agenda forward. At the time of this writing, Task Force members, of which I am a charter

member, include administrators, practitioners, and educators from laboratory credentialing organizations, universities, and laboratory facilities in the United States, the United Kingdom, Australia, and the Middle East.

The NCA has provided 24 years of certification for medical laboratory personnel and other credential-related public service activities (www.nca.org). Examination eligibility requirements for the selected examination require the same type of documentation as those required by the ASCP. In 2000, the National Credentialing Agency (NCA) launched the Temporary Status by Qualification (TSQ) credentialing program that allows international laboratory professionals without American or Canadian clinical experience to demonstrate their laboratory science knowledge by taking the NCA certification examination. A copy of the TSQ application form is available on the NCA website (www.nca.org). The TSQ credential is a temporary status that is granted for 4 years to qualified individuals who pass the NCA exam, during which time the individual may seek domestic clinical experience as evidence of entry-level work knowledge. The TSQ credential can then be converted to the appropriate NCA certification by providing evidence and supporting documentation that the NCA eligibility requirements for an acceptable clinical experience have been met. Prior to January 2003, international candidates applying for NCA certification needed to document practical experience within the United States, its territories or Canada as required by the specific eligibility route. Experience obtained outside of the United States, its territories or Canada was deemed unacceptable. However, with effect from 1 January 2003, NCA policy stated that "experience obtained outside of the United States, its territories or Canada cannot be accepted unless international experience is earned in a laboratory accredited by the

American Society of Histocompatibility and Immunogenetics (ASHI), College of American Pathologists (CAP), American Association of Blood Banks (AABB), Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Laboratory Services Accreditation Program" (www.nca-info.org/news.asp).

Established in 1939, American Medical Technologists (AMT) is a certification agency and professional membership association that represents over 25, 000 laboratory personnel and other allied health professionals, such as dental assistants and medical assistants, phlebotomy technicians, and allied health instructors. AMT has overseas certification testing sites in the United Arab Emirates, the Philippines, and Saudi Arabia (www.amtl.com/overseas.htm). AMT is researching the possibility of becoming formally recognized by the Department of Homeland Security (DHS), formerly called the Immigration and Naturalization Service (INS), to conduct VisaScreens for laboratory and other health care personnel. AMT is accredited by the National Commission for Certifying Agencies (NCCA), a separately governed accreditation arm of the National Organization for Competency Assurance (NOCA), which accredits certification organizations that comply with NCCA standards. The NCCA mission is to assist in the health, welfare, and safety of the public through their accreditation of certification bodies that assess professional competence. NOCA is a membership association of certification agencies that provide technical and educational information regarding certification practices.

The International Academy of Cytology (IAC) certifies cytotechnologists offering a credential CT(IAC). IAC has translated its cytotechnologist's examination into several languages. The Cytotechnology exam is offered 6 to 12 times a year in several countries.

In its 25-year history, IAC has certified over 10,000 individuals from 68 countries (www.cytology-iac.org).

Given the paucity of published reports on the internationalization of clinical laboratory/biomedical science curricula (Gallicchio, 1993; Gallicchio, Kirk, and Birch, 1998; Kraemer, 1998; European Professions in Biomedical Science, 2002) and scarce publications on international professional certification in the clinical/biomedical sciences (Kimball,Winter 2001; Kimball, 2001) this study is warranted and very timely. Moreover, in addition to the body of evidence presented in this thesis including: increased health care workers mobility; the growing health care crises in certain regions in the United States and across the United Kingdom; Goldsmith's "Millennium Intent" initiative; along with the aforementioned globalization initiatives such as the VisaScreen™ and TSQ programs, the results of this study provide valuable insight to American certification and accreditation bodies and British registration and regulatory organizations about the issue of international professional certification for clinical laboratory/biomedical scientists.

1.3 Problems Addressed in this Study

The world is rapidly changing and globalization is helping to establish common political, economic, and social agreements between countries following the signing of the 1993 Maastricht Agreement in the establishment of the European Union (www.eurotreaties.com/maastrichtext.html), the signing of the 1999 Bologna Declaration by 29 countries to reform the structure of their higher education systems and to promote curricular development, inter-institutional cooperation, mobility schemes and integrated

programs of study, research and training (www.crue.org/eurec/bolognaexplanation.htm) and the 1994 signing of the North American Free Trade Agreement between the governments of Canada, Mexico, and the United States (www.mexico-trade.com/nafta.html). These agreements provide the rationale and context for government involvement in enhancing educational opportunities and removing barriers that limit the flow of students, educators and professionals, and of projects and practices across national and international borders. Having opened the doors to European and North American mobility in higher education, global mobility has encouraged the development of common education standards, mechanisms for mutual recognition, and liberated processes by which professionals are permitted to practice. However, in terms of the clinical/biomedical sciences programs, education and training vary considerably from country to country due to the rigorously structured nature of the academic curricula imposed by accreditation agencies, certification bodies, ministries of health and education, and licensure laws, thereby limiting global mobility of qualified laboratorians. Who has the ultimate jurisdiction to propose, implement, and or monitor international standards is yet to be decided.

Although we do not educate biomedical/clinical practitioners internationally, health issues are nevertheless international in scope and will only increase as health care problems become more universal in diversity and impact on local, regional and national economies. Current examples of this are the acute threats of bioterrorism such as the use of anthrax spores for terrorist purposes that occurred in the United States post -September 11, 2001, the worldwide pandemics of AIDS and tuberculosis, and other emerging infectious cases such as the recent outbreaks of different strains of Avian Influenza (bird

flu) and Severe Acute Respiratory Syndrome (SARS) in Asia, Canada, and other parts of the world.

The specific problems addressed in this study are: 1) the critical laboratory workforce shortages in the United Kingdom and the United States; 2) the lack of transnational education and training standards for clinical laboratory/biomedical scientists; 3) the limited opportunities for international student exchange programs in clinical/biomedical sciences students; and 4) the limited employment opportunities for the underutilized pool of qualified internationally educated and experienced laboratory professionals residing in the United States, such as those internationally trained immigrants living in California, many of whom are highly trained laboratory professionals who are blocked from laboratory service in communities that are in great need of their skills. California's "Welcome Back Program," a state-wide initiative funded by the California Endowment, offers counseling and educational programs to internationally trained health professionals and provides assistance in obtaining appropriate licenses, credentials, orientation and job placements to work in the United States healthcare system (www.e-welcomeback.org).

At a time when the American and British health care systems are faced with critical shortages of laboratory and health workers, the health care industry may need to rely on foreign-educated and trained graduates to fill vacancies that, if left unfilled, will exacerbate the looming health care crisis. In terms of the laboratory workforce shortages in the UK, the Institute of Biomedical Science (IBMS) issued a press release in 2000 of a survey conducted among biomedical scientists working in NHS hospital laboratories (www.ibms/org/cgi-bin/new/news/display.cgi?config=press&contref=948709977). The

findings indicated that 88% of all laboratories surveyed considered themselves short staffed, that 58% of the laboratories were forced to use less qualified or unqualified staff instead of biomedical scientists, and recruitment and retention of qualified biomedical scientists was worsening. These shortages limited the hours of operation of accident and emergency units in hospitals in several areas across the United Kingdom (www.ibms.org).

In the United States, data collected during a 2000 wage and vacancy survey of medical laboratories yielded the highest vacancy rates reported throughout a twelve-year comparison period, and that difficulties in filling open positions increased significantly for clinical laboratory scientists/medical technologists (Ward-Cook and Tanner, 2000). The United States Bureau of Labor Statistics estimated that approximately 13,500 clinical laboratory science positions are needed each year in the American medical laboratory workforce from 2002 through 2010 (Ward-Cook, 2002). With American - based educational programs projected to produce less than half that number of graduates each year, this magnifies the growing health care crisis in the United States.

1.4 The Purpose of the Study

The primary purpose of this study is to explore the feasibility and substance of transnational professional credentialing for clinical laboratory/biomedical sciences in order to potentially expand the pool of internationally educated and experienced laboratorians living in the United Kingdom and the United States. In order to improve the highly skilled laboratory workforce needed to ensure the quality and scope of services delivered by the international network of medical laboratories, increased recruitment and

retention of qualified laboratory personnel is imperative. As previously indicated, with up to 80% of the "data" generated in a standard United States patient medical record containing information produced by the clinical/biomedical laboratory, these services play a vital role in quality patient care (www.ascls.org/position/scope_of_practice.asp). Increasing the pool of educated and trained clinical laboratory/biomedical scientists is a top priority for American and British laboratory-related educators, credentialing bodies, and health care providers. American - based medical institutions are considering whether foreign biomedical science graduates could add to the employment pool in order to address the crisis in under-staffing of clinical medical laboratories in the United Kingdom and the United States. However, there are concerns over how foreign educational experiences can be validated in terms of each host country's practices and standards. With the formation of the European Union (EU) and its associated new globalization realities, a new association for European medical scientists was formed in 1993 called the European Professions in Biomedical Science (EPBS). Based on the concept of a Euro Biomedical Scientist, the (EPBS) is collaborating with other like-European societies to develop a European register for biomedical scientists and to develop common codes of conduct, minimum standards, and educational professional criteria (EPBS, 2002). Similarly, in the United States the ASCP-Board of Registry, members of the Globalization Task force are working with representatives from like-societies such as the Institute of Biomedical Science (IBMS) and the Australian Institute of Medical Science (AIMS) to examine the similarities and differences of the education, training, and entry-level duties of laboratory scientists. The collaborations mentioned above have not existed

in the past and can lead to key global policy initiatives for the laboratory profession of the future.

1.5 Aims of the Research

The main questions relating to international programs in Clinical Laboratory/Biomedical Science are addressed in this thesis as follows. The first question seeks to determine the number of laboratory sciences students who participate in international exchange programs. According to the Institute of International Education and Pennsylvania State University to name a few, 160, 920 American college students received academic credit for study abroad in 2001-2002 (www.collegian.psu.edu/archive/2003/12/12-11-03tdc/12-11-03dnewsw-01.asp). Yet, the program disciplines in which the study abroad students are enrolled are not available in these reports. Since data on international students' programs of study are usually maintained by the awarding institutions, this thesis sought to query university-based laboratory sciences programs in order to identify the number of study abroad programs, including the number of students and faculty/staff involved in such programs. The rationale for this question emanates from the lack of available published statistics regarding laboratory science student involvement in study abroad programs.

Despite the aftermath of the tragic events of the September 2001 terrorist attacks in the United States, the National Association of International Educators (NAIE) issued a report urging the federal government to significantly increase the number of students studying abroad (Bollag, 2003). Furthermore, the report urged higher education institutions to "remedy barriers to study abroad." In light of recent internationalization

initiatives by NAACLS and the ASCP's Board of Registry (ASCP-BOR), a second question emerged regarding the level of interest among laboratory program directors in international certification for the laboratory profession. The NAACLS international initiative occurred in 2001, when the NAACLS board of directors voted to open their accreditation operations to programs outside of the United States (www.naacls.org/news/extra/international.asp). It should be noted that a number of other allied health professions have moved toward internationalizing their accreditation operations such as speech/language pathology and occupational therapy (Goldsmith, 2002). In 2002, the ASCP-BOR launched a Globalization Task Force to investigate the feasibility of globalizing their certification process. International initiatives such as these set the stage for international professional certification. However, attainment of international professional certification can not be realized without the cooperation between ASCP, NAACLS and their counterparts overseas.

The following questions evolved from personal discussions with the executive head of the ASCP Board of Registry during the pilot testing phase of the survey: 1) what would be the recommended pattern or model by which biomedical scientists in the United Kingdom and clinical laboratory scientists/medical technologists in the United States would be eligible for international professional certification? and 2)should American and British laboratory credentialing agencies consider mutual credentialing for graduates of accredited clinical/biomedical science programs? These questions were of extreme value to the ASCP-BOR because apparently this study served as an impetus for the executive head to begin exploring the feasibility of globalizing the ASCP-BOR certification process. These particular questions were also influenced by Goldsmith's case study in

developing a mutual recognition agreement. According to Goldsmith, "common international standards are generally developed by an international body made up of representatives of various countries that develop country-neutral standards of certification" (Goldsmith, 2002).

In summary, this study was multifaceted in design and consisted of two main stages. The first stage of the research included a survey questionnaire designed to solicit professional opinions and experiences of laboratory program directors regarding international student and faculty exchange programs and international professional certification. During stage one, an extensive review of the relevant international literature was conducted to determine what had already been achieved in Europe and North America regarding international professional certification of allied health professionals. In addition, laboratory-related organizations and associations, credentialing agencies, and consortia involved in international professional certification and accreditation for clinical/biomedical and health sciences were contacted, and international conferences were attended, to explore existing processes for international professional credentialing. The outcome of this research contributed to stage two; the development of an international program of study for laboratory sciences students. Details of this program are presented in Chapter 7.

Chapter 2 presents the methods of this research investigation. The third chapter presents the development of the international survey, while Chapter 4 describes the results of the survey. Chapter 5 presents an evaluation of the survey results and Chapter 6 the discussion, conclusions of the evaluation, and recommendations stemming from this

study. Chapter 7 details the development of a model international student exchange program.

Chapter 2

METHODS

"The task is not so much to see what no one yet has seen, but to think what nobody yet has thought about that which everybody sees." Arthur Schopenhauer, 1788-1860

2.1 Background

The primary aim of this research was to investigate the feasibility of international certification for laboratory professionals, given the lack of mutual credential recognition agreements between the United Kingdom and the United States. I chose a qualitative orientation to the study along with some quantitative elements because of the nature of the research questions. Denzin and Lincoln (1994) define qualitative research as a "multimethod in focus, involving an interpretive, naturalistic approach to its subject matter." In other words, qualitative researchers study things in their natural settings and try to interpret phenomena in terms of the meanings people bring to them; thus, qualitative research involves the studied collection and utilization of various empirical materials such as case studies, personal experiences, interviews, observational, interactional, visual, and historical texts that describe both routine and problematic moments and meaning in peoples' lives (Denzin and Lincoln, 1994). As Silverman puts it: "the methods used by qualitative researchers exemplify a common belief that they can provide a 'deeper' understanding of social phenomena than would be obtained from purely quantitative data" (Silverman, 2000). Ragin characterizes a key difference between qualitative and quantitative inquiry by stating that "quantitative researchers work with a few variables and many cases, whereas qualitative researchers rely on a few cases and many variables (Ragin, 1987). Given the hybrid approach to this research, of special interest to me is Hammersley's comments on the absurdity of pushing the qualitative/quantitative distinction too far by his statement that:

"we are not faced with a stark choice between words and numbers, or even between precise and imprecise data; but rather with a range from more to less precise data. Furthermore, our decisions about what level of precision is appropriate in relation to any particular claim should depend on the nature of what we are trying to decide, on the likely accuracy of our descriptions, on our purposes, and on the resources available to us; not on ideological commitment to one methodological paradigm or another."

(Hammersley, 1992).

2.2 The Research Plan

The research plan consisted of two separate and distinct stages. Both stages were necessary to address the specific problems identified in Chapter 1 relative to the laboratory workforce shortage, limited student exchange opportunities in clinical/biomedical sciences, and the underutilized pool of foreign educated and qualified laboratory professionals seeking to gain comparable employment in the United States. Stage One consisted of an international survey that was conducted of laboratory educators from clinical laboratory science/medical technology programs in the United States and biomedical science programs overseas and informed Stage Two, which was the design and development of an international education exchange program for European biomedical science students and American clinical laboratory science students. The framework for the exchange program that operates through a Transatlantic Health Science Consortium evolved from the outcomes of this research. Details of the international survey are presented in this chapter. Information related to the development of the survey is featured in Chapter 3.

> *"To behold is to look beyond the fact; to observe, to go beyond the observation. Look at a world of men and women, and you are overwhelmed by what you see. Select from that mass of humanity a well-chosen few, and these observe with insight, and they will tell you more than all the multitudes together. This is the way we must learn; by sampling judiciously, by looking intently with the inward eye. Then, from these few that you behold, tell us what you see to be the truth. This is the descriptive-the normative-survey method."* Paul D. Leedy (Leedy, 1993)

2.3 The Research Questions

A qualitative approach involving a survey questionnaire was used to inform the following research questions:

1. How many clinical/biomedical sciences students participate in current international exchange programs?
2. What is the level of interest and commitment among laboratory program directors in international certification for biomedical scientists and clinical laboratory scientists/medical technologists?
3. Should American and British laboratory credentialing agencies consider mutual credentialing for graduates of accredited clinical/biomedical science programs and how much support exists?
4. What would be the recommended pattern or model by which biomedical scientists in the United Kingdom and clinical laboratory scientists in the United States should be trained in order to be prepared for possible international professional certification?

Since a qualitative approach involves hypothesis-generating research rather than hypothesis testing (Silverman, 2000), no hypothesis was offered before the start of this research.

2.4 The Research Framework

A paradigm is "a basic set of beliefs that guide action, whether of the every day garden variety or action taken in connection with a disciplined enquiry" (Guba and Lincoln 1998).

Guba and Lincoln (1998) identify four research paradigms or worldviews: *positivism*, *post positivism*, *critical theory*, and *constructivism*, all of which are characterized in relation to a basic set of assumptions or beliefs that guide qualitative inquiries. These assumptions are related to the following issues: ontological -- the nature of reality; epistemological--the relationship of the researcher to that being researched; methodological--the process of the research; axiological -- the role of values in a study; and rhetorical -- the language of the research. Gephart (1999) compares and contrasts the four research paradigms and provides valuable insight about the role of philosophical assumptions and paradigms in conducting research. Gephart differentiates *positivism* from *post positivism* in reporting that: *positivism* "assumes an objective world hence it often searches for facts conceived in terms of specified correlations and associations among variables" whereas *post positivism* assumes that "an objective world exists, but it assumes the world might not be readily apprehended and that variable relations or facts might be only probabilistic, not deterministic" (Gephart, 1999). In contrast to *positivism,* which is concerned with objective reality, Gephart (1999) asserts that in a constructivist paradigm, constructionists "argue that knowledge and truth are the result of perspective, hence all truths are relative to some meaning context or perspective." *Critical theory* is a term that is rooted from the theoretical

tradition developed by a group of writers connected to the Frankfurt School in Germany based on the German tradition of philosophical social and political thoughts stemming from Marx, Hegel, Kant, and Weber (Kincheloe and McLaren, 2000).

This study was influenced by a *constructivist* paradigm and assumes a relative ontology by which reality exists in the form of multiple mental constructions, which are socially and experimentally based. For example, multiple realities exist, such as the realities of individuals who are being investigated and those of the researcher and the readers interpreting a study. Within the framework of the *constructivist* paradigm, epistemology is assumed to be subjective. Constructivists' views contend that objective truth and knowledge are based on one's perspective, and that truth and knowledge are created, not discovered, by the mind (Schwandt, 2000). The aim of constructivists is to identify a variety of constructions in order to gain as much consensus as possible, the process of which includes two forms – hermeneutic and dialectic. The hermeneutic aspect involves making sense of what has been observed in such a way that it communicates understanding, whereas the dialectic aspect involves comparing and contrasting the construct of all the individuals, including the researchers, so that each respondent confronts the constructions of others in order to produce as informed a construction as possible. Furthermore, constructionists believe that collected facts need to be independent of theoretical statements, that reality exists only in the context of the mental framework or construct that has been created for thinking about it, and that inquiry can't be value free as the results of the inquiry are shaped by the interaction of the inquirer and the inquired.

Creswell (1998) asserts that clarifying research bias from the outset of a study is imperative so that the reader understands the position of the researcher and his or her assumptions or biases that have an impact on the inquiry. As Thorne and her colleagues suggest, "the disciplinary

orientation of any qualitative research study can have a profound influence on the way the research problem is framed, the way the research questions are posed, the data that are gathered and analyzed, and the findings that are produced" (Thorne, 2002). Throughout my career, I have actively participated in professional societies, attended conferences and continuing education programs, and served as education coordinator of clinical laboratory sciences students. As such, I am informed of the major issues, challenges and constraints confronting the laboratory profession and the regulatory policies imposed by credentialing agencies, and state licensure boards. Hence, my educational background, training, and professional experience have shaped my beliefs that the laboratory profession must move forward and explore globalization issues. That said, I acknowledge that my beliefs possibly influenced the way the research problem was framed.

2.5 Stage One: The Survey

A descriptive survey was used for this research. According to Paul Leedy (1993), the descriptive, or normative, survey looks with intense accuracy at the phenomena of the moment and then describes precisely what the researcher sees. In other words, the descriptive survey method relies on observation as the primary means of collecting data. For this study, I selected an international survey, represented by the countries in which the programs were located, to investigate opinions and experiences of laboratory program directors about transnational laboratory exchange programs and their level of interest in international certification for laboratory professionals. The information below provides some general information about the survey. However, the next chapter presents more details related to the survey development including the survey rationale and specifics related to the pilot testing of the questionnaire, to name a few.

2.6 The Population and Sampling Frame

Academic heads of laboratory sciences programs were the target population for this study. The sampling frame was drawn from laboratory program directors of National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) - accredited, undergraduate Clinical Laboratory Science/Medical Technology (CLS/MT) programs across the United States and liaison officers of Institute of Biomedical Science (IBMS) Biomedical Science - accredited, undergraduate Biomedical Science (BMS) courses in the United Kingdom, Australia, Hong Kong, Ireland, Malaysia, Malta, and Sri Lanka. According to Frankfort-Nachmias and Nachmias (2000), in smaller-scale studies, the sampling frame may be based on city directories, membership lists held by many public and private organizations, or telephone directories. The population selected for this study was consistent with a) the aforementioned sampling frame described by Frankfort-Nachmias and Nachmias (2000) and b) "population validity" needed in survey research as discussed by Sapsford (1999). Sapsford defines population validity as "the extent to which the sample gives an accurate representation of the population which it is supposed to represent" (Sapsford, 1999). Simply put, Moore (1997) defines the population in terms of one's desire for information (Moore, 1997). The composition of the population was determined by an outward semblance of homogeneity exemplified by the sampling frame.

It is acknowledged that to draw the sample from one particular group could lead to bias and question the ability of the researcher to generalize the results and the consequences of finances and time places certain constraints upon the choice of the target population and this must be taken into consideration when analyzing the results. Firstly, the selection of this population was made in order to maximize the probability that the sample surveyed is representative of the

population from which they are drawn. Secondly, this population conformed to a designated set of specifications in terms of comparable education standards, certification/registration and accreditation processes. Thirdly, ease of access to the population was a key factor for choosing to carry out the study with this group. The lists of laboratory science programs were obtained from the NAACLS and IBMS websites. Specific information containing the individual names, demographic data, email addresses, specific program types, names and addresses of institutions was posted, and regularly updated, on both websites (www.naacls.org; and www.ibms.org).

2.7 Pilot Test

Prior to distribution of the survey, the questionnaire was pretested on a small population (n=30) of colleagues and friends in order to avoid ambiguity in the questionnaire. According to Leedy (1993) all questionnaires should be pretested, in the form of a pilot study, by giving the questionnaire to a least 6 persons to test whether or not there were any questions or choice items that they had difficulty understanding. Based upon valuable feedback gathered during the pilot test, the questionnaire and cover letter were revised, modified, converted to an electronic format, and submitted for approval, prior to distribution, to the Ethics Committee of the Department of Forensic and Investigative Science at the University of Central Lancashire. More information about the pilot study is presented in Chapter 3.

2.8 Ethical Approval

In order to protect the rights of the participants, they were informed, via a written letter that accompanied the survey questionnaire, about the purpose and proposed methodology used in this study. The letter also provided language regarding anonymity, confidentiality, and informed

consent as evidenced by the following statements: "all responses will be kept confidential. In the presentation of the findings, no individual or institution will be identified. Please note that completing and returning the survey questionnaire constitutes your informed consent to participate in this project."

Ethical approval for this study was sought from, and granted by the Ethics Committee of the Department of Forensic and Investigative Science, University of Central Lancashire.

2.9 The Survey Questionnaire

The survey referred to in this thesis examined the thoughts and opinions of the clinical/biomedical laboratory science/medical technology educators regarding international education exchange programs and possible globalization of the certification/state registration processes that could ultimately lead to international professional certification for qualified laboratory professionals.

In general, the survey consisted of a total of 17 questions including open-ended, closed-ended, and contingency questions. Open-ended questions are often used in questionnaires designed to study public opinion because they are flexible and are not followed by any kind of specific choice. According to Frankfort-Nachmias and Nachmias (2000), the virtue of open-ended questions is that they don't force the respondent to adapt to preconceived answers; hence they allow one to express his or her thoughts freely and spontaneously in one's own language. Closed-ended questions are quick to answer, require no writing, and their analysis is relatively straightforward. Contingency questions apply only to a subgroup of respondents. For example, in this survey respondents were asked "Does your program have an international exchange program?" If the respondent answered "yes" to this question, they proceeded to a number of

follow-up questions. If they answered "no," then they skipped the follow-up questions because the relevance of the follow- up questions was contingent upon a "yes" response to the original question. In some instances, the questions included an alternate choice such as "other (please specify)" or "other (specify and rate)" as recommended by Oppenheim (1992) which gives the respondent the opportunity to provide ideas or concepts that were not already mentioned as a choice. In other instances, the questions included a 5-item Likert scale to facilitate correlative analyses. In constructing the Likert-type scale, I asked the respondents to rank each statement from 1 to 5, with 3 as the neutral position as follows: 1 = very important; 2 = fairly important; 3 = neutral; 4 = somewhat not important; and 5 = not important. As Hicks puts it, "the strength of agreement or disagreement can be measured in a number of ways, but one of the most commonly used methods is a five-point ordinal scale, called a Likert scale" (Hicks, 1999).

According to Patten (2001) using "neutral" is a judgment call and when used as a choice, it should be listed as the middle position, and notes that "neutral" is not equivalent to "don't know." "Don't know" was deliberately omitted as a choice item because according to Patten, "don't know" is not a level of agreement and may mean neutral or undecided. In other words, not knowing about a topic does not mean the same thing as being neutral toward it. However, the "neutral" choice may be attractive to respondents who don't wish to reveal their position on a controversial topic and the absence of a middle position may be frustrating to respondents who are truly neutral or undecided.

2.10 Survey Distribution

The questionnaire, including the cover letter, was launched via electronic mail (e-mail) on October 23, 2002 and distributed periodically throughout the year. The final deadline was October

31, 2003. Reminders were emailed to non-respondents at various stages. The survey was formally endorsed by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and the American Society for Clinical Pathology -Board of Registry (ASCP-BOR) and supported by the Executive Head of Education at the Institute of Biomedical Science (IBMS). All information obtained from the subjects was collected on a dedicated email address labeled lancashirestudy@earthlink.net .

2.11 Treatment of the Survey Data

A mailing list in the form of a database and spreadsheet, using Microsoft Office XP Excel, was developed for data entry, data collection, and data analysis. To ensure accuracy and currency of program information, the mailing list was finalized one week prior to administration of the survey. Statistical analysis was based on social science research methodology which uses descriptive and inferential statistics, evaluated with the computerized statistical package for the Social and Behavioral Sciences (SPSS for Windows, Version 11.1) to provide graphical and tabulated data (Cronk, 2002). Subject responses to all force-choice type questions were entered and stored in the database. For rank-order type questions, subjects were asked to read each statement and indicate their opinion using a five-point Likert rating scale for which 5= not important; 4= somewhat not important; 3= neutral; 2= fairly important; and 1=very important. Midpoint responses to rank-order type questions were identified. Any response below the mid-point (2.5) was considered by the respondents to be important. Any response above 2.5 was considered by the respondents not to be important. According to Sapsford (1999), "the mean is the most useful average figure for purposes of analysis, but it is not always the most readily interpretable."

For clarity, quantitative and qualitative evaluations were used in this study. A brief description of the chosen methods of data analysis is provided. Numeric data were reported as frequencies and distributions and chi- square (χ^2) as recommended by Norman and Streiner (1997), who suggest that chi-square analysis is the most commonly used non-parametric test in that it measures the statistical significance of observed frequencies and values. As Salkind (2000) puts it, the chi-square test "involves a comparison between what is observed and what would be expected by chance" and frequency distribution is defined as "a method for illustrating the distribution of scores within class intervals." The chi-square test was used for the categorical questions in the "Transatlantic Exchange" section of the survey. The binomial test was used for the yes/no questions that appeared in the "International Professional Certification" section of the survey. The binomial test only works for a single sample with two cells (Norman and Streiner (1997).

According to Hicks (1999), qualitative research methods are used by an investigator to gain insights into another individual's opinions, views, feelings and beliefs within their own natural settings. The qualitative data analysis for this survey stems from the grounded theory approach of Strauss and Corbin (1990). Neutens and Rubinson (2002) described grounded theory as a conceptual framework that builds from the bottom up. The investigator using grounded theory codes and categorizes pieces of data as they are being collected, and a tentative conceptual framework is generated, which can be modified later. According to Woods and Catanzaro (1988), grounded theory techniques involve constant analysis of data as they are generated and the ongoing comparison of new and old data as categories emerge.

Thematic content analysis served as my qualitative method of choice. As Woods and Catanzaro state, thematic content analysis is useful for analyzing qualitative data because it is

sensitive to the context and symbolic forms of the data and it can be used with textual data (Woods and Catanzaro, 1988). In addition, Patten (2002) suggests that thematic analysis takes on a categorical or topical form compared to pattern analysis. Pattern analysis usually refers to a descriptive finding, such as all participants reporting feeling jubilant when they passed their board examination, while a theme takes on a more topical form such as "Jubilance." According to Burnard (1991), thematic content analysis is a method that was developed from those described in the grounded theory literature (Strauss and Corbin, 1990), in the literature on content analysis, and adapted from the grounded theory approach of Glaser and Strauss (1967). Barney Glaser and Anselm Strauss were two sociologists who reported that the grounded theory approach is a scientific method that, if carefully conducted, meets the "good" science criteria for significance, theory-observation compatibility, reliability, reproducibility, verification, and rigor (Strauss and Corbin, 1990). The method used in this thesis to categorize and codify the respondent's statements is a modification of Burnard's multiple step approach that I worked through in order to identify common themes and reflect issues addressed by the respondents. The 4-step approach that I used is described below.

2.11.1 Step 1: Process of Immersion

The initial stage of my thematic analysis consisted of reading through all of the participant's responses to each question. Then each of the respondent's statements was transcribed verbatim into a word document. According to Burnard (1991), this stage allows the researcher to become immersed in the data and provides the researcher with the opportunity to become "fully aware" of the respondent's frame of reference.

2.11.2 Step 2: Open Coding and Interobserver Reliability

As I read through the statements, I developed as many categories as were necessary to best describe the contents. The *a posteriori* technique was chosen to code information received from open-ended questions. In the *a posteriori* method, the categories of analysis are extracted from the information gathered rather than from defined categories that were decided upon beforehand (Bailey, 1991). Before proceeding with the theme analysis I asked two colleagues, who were not involved in any other aspect of this study but who were experienced qualitative researchers, to generate their own list of categories without seeing mine. Then we compared the similarities and differences of the three lists. Through our mutual dialogue and interpretative session, we identified the themes that were shared across the group. This stage essentially attempts to enhance the interobserver reliability of the categorization method and guards against researcher bias.

2.11.3 Step 3: Sorting and Saving

Copies of the respondent's statements for each question were cut up, sorted by categories, and the statements were laid out on a large table so that they were easily visible. Ensuring that the context of the coded sections is maintained, photocopies of the transcriptions were made and used for reference purposes to avoid the risk of altering the meaning of the whole statements.

2.11.4 Step 4: Reporting the Findings

All of the sorted categories were kept on file for each of the questions while writing up the findings for reference purposes. Maintaining files for each of the questions during the write up of

the results was done in order to access the original meanings and contexts of the respondent's statements and to avoid any possibility of transcription error.

2.12 Judgmental Validity and Reliability

Validity and reliability of the research methods and conclusions drawn from the findings are essential. Hammersley (1992) writes "by validity, I mean truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers." Hammersley goes on to say that "reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions" (Hammersley, 1992). Patten (2002) asserts that in order to establish validity, special techniques may be employed and that an instrument, or the measurement tool, is valid when it measures and performs the functions that it purports to perform. For the purpose of this study, a survey was employed as the measurement tool to inform the research questions. To determine the validity of the survey, judgments on the appropriateness of its contents were based on face validity derived from the field study. In this approach to judgmental validity, I determined that the instrument appeared to be valid on the face of it. In other words, based on superficial inspection, the survey appeared to measure what is purported to measure. Patten also states that "to be useful, an instrument must be both reasonably valid and reasonably reliable." To maximize reliability in this study, I used interobserver reliability during the theme content analysis. As described previously in section 2.10 entitled "Treatment of Survey Data," two other researchers were invited to participate in the category system process. The resulting categories were based on agreement between the three of us.

2.13 Challenges Associated With Data Analysis

Although the qualitative and quantitative methods chosen for this study are a convenient and appropriate way to summarize data, they present certain challenges. In the case of frequencies and distributions for example, it is difficult to draw graphs and much easier to provide computer printouts of a series of numbers than to find an alternate way to summarize the information. Thus, I designed tables to present these types of data. I placed each choice item on the left hand column and had 3 columns to the right of each item that listed the number of respondents and percentages of those respondents who believed the item was either 1) "important," 2) "not important," or 3) "undecided." In another instance, I experienced some challenges during the theme content analysis of the study. The main challenges included: some difficulty in understanding a few of the respondents' statements; several respondents misunderstood the meaning of certain questions; and my inability to clarify the meaning of certain subject responses.

2.14 Limitations of the Survey

1. The sample population was limited to clinical/biomedical science/medical technology programs that offer an honors degree.
2. Biotechnology, Biological Sciences, or graduate degree programs were excluded as they did not meet the program eligibility criteria established for this study.
3. The sample population was limited to clinical/biomedical science/medical technology programs accredited by either the Institute of Biomedical Science (IBMS) or the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS).

4. The geographical location was limited by the countries where programs are accredited by NAACLS and IBMS.
5. The lack of opportunity for verbal clarification may have created communication and interpretation difficulties for the subjects participating in the survey.
6. Only senior-level, administrative staff was included in the survey.
7. The population demographics were only related to the topic being studied.

Chapter 3

DEVELOPMENT OF THE SURVEY

3.1 The Survey Research Method

Three survey methods are commonly used to elicit information from research subjects. These include telephone surveys, mail questionnaires, and personal interviews. After consultation with my thesis committee regarding the advantages and disadvantages of the three possible survey research methods, I elected to use an electronic mail (e-mail) questionnaire to elicit information from perspective respondents. I chose the e-mail survey method because I thought it was a practical measurement tool to inform the research questions and the most advantageous method based on my research goals and objectives. For this research investigation, the advantages of using an e-mail questionnaire outweighed the advantages of using a mail questionnaire in terms of efficiency, cost, and speed.

According to Sheehan (2001) electronic questionnaires have demonstrated superiority over postal mail surveys by virtue of the speed of response, efficiency, and cost-effectiveness. In terms of the cost benefits of e-mail surveys, the cost of an e-mail survey has been estimated to be from 5% to 20% the cost of a mail survey based on the reduction of paper and the elimination of mailing costs (Weible and Wallace, 1998; Dillman and Bowker, 2001). Even though there are distinct advantages to using e-mail surveys, there are also disadvantages in terms of accessibility and response rates, as not everyone has access to the Internet and the World Wide Web or e-mail addresses, but all in the targeted sample population had. Many researchers have found response rates from e-mail surveys to be lower than telephone and mail surveys (Shannon and Bradshaw, 2002). In a recent analysis of 49 electronic survey studies, Cook and colleagues reported

an average response rate of 39.6% for e-mail surveys, a significantly lower response rate than that reported for personal interviews and mail surveys (Cook, Heath, and Thomson, 2000). According to Frankfort-Nachmias and Nachmias (2000), the typical response rates for a personal interview and a mail survey are 95% and between 20 and 40 percent, respectively.

3.2 The Survey Rationale

The rationale for this survey research was based upon the need to elicit objective information from educators in the international laboratory community regarding current and future transatlantic education and training programs that could ultimately lead to identification of core competencies and training standards for international professional certification of qualified laboratory personnel. With international programs of cooperation in place, it may be possible to increase numbers of quality trained laboratory personnel available to address the severe laboratory workforce shortage that exists in certain regions of the United States and across the United Kingdom. This survey has the potential to contribute to producing an expert consensus regarding future directions that credentialing agencies such as the American Society for Clinical Pathology Board of Registry (ASCP-BOR), the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), and the Institute of Biomedical Science (IBMS) could take to address globalization of their certification, accreditation, and registration processes.

As previously stated, before this research study began, approval was sought from the Ethics Committee of the Department of Forensic and Investigative Science, University of Central Lancashire (UCLAN).

3.3 Ethical Approval

Once the research was approved by the appropriate UCLAN committees, a survey was created and remained at a rough draft stage until a pilot study was completed and the recommended changes were made. The final iterations of the survey questionnaire and cover letter were approved by the Ethics Committee of the Department of Forensic and Investigative Science at UCLAN. Following UCLAN approval, the survey questionnaire was converted from the original copy format to an electronic format for distribution electronically (Appendix B).

3.4 The Pilot Study

A cover letter and a series of questions were developed into a questionnaire in order to elicit information from educators about their experiences with transatlantic student exchanges and their opinions and thoughts regarding the notion of such an exchange and about credentialing issues confronting the laboratory profession. A pretest was conducted to identify any flaws in the letter and questionnaire and to allow for revisions and/or corrections. As recommended by Neutens and Rubinson (2002), a sub-sample for the target population was selected and the questionnaire was administered by email, the same medium intended for the definitive study. Both the letter and survey were distributed to a total of thirty British and American educators, administrators, students, researchers, and practitioners of the clinical and health sciences. Those in the pretest sample were directed to perform a critical analysis of all aspects of the letter and instrument including: clarity of question wording and order, response categories, physical layout, instructions, length

of time for answering the questions, and the like. Corrections were made on both the questionnaire and letter according to participants editorial comments submitted to me during the pretest, prior to distribution of the questionnaire used in the actual study.

3.5 Construction of the Cover Letter

In choosing the style of the cover letter, I designed a one-page letter that would address informed consent, emphasize the importance and potential value of the study, and recognize endorsements from the credentialing agencies. The cover letter was meant to be a succinct and concise overview of the research aims. It included the following information that I believed would convince the respondents to complete the questionnaire and return it in a timely fashion. Firstly, it identified me as the sponsor of the research study by saying "I am a doctoral student at the University of Central Lancashire in the United Kingdom conducting a research study entitled 'A Model for International Clinical/Biomedical Science Programs'." It explained that the purpose of the research was "to develop a model for an international program of study for clinical laboratory scientists/medical technologists in the United States and biomedical scientists in the United Kingdom and affiliated accredited sites." The importance of the study was as follows: "to contribute to producing an expert consensus regarding future direction of transnational training and education programs." Secondly, the letter stated that the information gathered from the survey would be used to "foster transatlantic study and workforce opportunities for CLS/MT/BMS students;" "provide information about educational accreditation and certification barriers that currently exist;" and "provide data demonstrating the need and interest for international partners to work together." Thirdly,

the letter included the names of the American Society for Clinical Pathology, Board of Registry and the National Accrediting Agency for Clinical Laboratory Sciences, the credentialing agencies that endorsed the survey. The letter concluded with a confidentiality statement: "all responses will be kept confidential. In the presentation of findings, no individual or institution will be identified", my contact information, and a thank you for participation. The matter of informed consent was addressed in the following statement "please note that completing and returning the survey questionnaire constitutes your informed consent to participate in this project."

> *Murphy's Law of Questionnaire Design: "Anything that can possibly be misunderstood in a questionnaire will be."*
>
> Karyn Holm and Jane Gentry Llewellyn (1986)

3.6 Construction of the Questionnaire

The design of the survey instrument heeded the following guidelines for a successful questionnaire recommended by Sapsford: 1) clear and unambiguous questions; 2) an efficient and trustworthy way of coding the data for future analysis; and 3) a standardized presentation so that all respondents are asked exactly the same questions in the same order (Sapsford, 1999). In constructing the questions, I made the questions as short and to the point as possible to avoid sacrificing clarity. I also made sure that the questions were relevant to the target population. As Holm and Llewellyn indicate, "when a respondent encounters too many 'not applicable' questions, he or she quickly loses interest in completing the remainder of the set" (Holm and Llewellyn, 1986).

Questions varied by length and type and the length of the questionnaire was designed to take between 15 and 20 minutes to complete, well within the guidelines recommended by prominent researchers to bring about the greatest response (Frankfort-Nachmias and Nachmias, 2000; Neutens and Rubinson, 2001). On average, those in the pretest sample completed the questionnaire within 20 minutes. Some questions employed a 5-point Likert rating scale with endpoints very important (1) and not important (5). Other questions called for a "yes" or "no" response.

3.7 Characteristics of the Questions

The questionnaire consisted of seventeen (n=17) questions. The questions are presented below according to the categories in which they were placed on the questionnaire. The rationales for these questions are also stated.

3.7.1 Category 1: Existing Program Information

Questions 1 to 5 were categorized as "existing program information" and were designed to obtain information about current, active international student and faculty exchanges among the programs surveyed. Specifically, these questions asked the subjects to identify the countries that hosted such exchanges and provisions for student financial aid, room and board associated with their exchange program. For those that responded "no" to the question of why they do not participate in educational exchanges, it was important to determine the reason for non-participation, what the barriers were, and how these barriers might be overcome. For those that responded to the question "no" but would be interested in developing exchanges, it was equally important to determine

the reasons why they did not participate and to recognize whether or not the obstacles could be overcome.

The rationale for this set of questions was based on the lack of available data due to the paucity of published reports at the time of this writing and the unmet need to document the number and scope of international education exchanges in the academic area of clinical/biomedical sciences at the national and international levels.

Category 1 questions are as follows:

1) Does your program have an international exchange program? Yes or No.

   If the participant answered no to this question, then they were directed to proceed to question # 6.

2) Please provide the following information about your international exchange program/s.

   2a) name of host institution/s;

   2b) name of host country/countries;

   2c) overall number of students exchanged;

   2d) overall number of faculty exchanged;

   2e) average length of exchange period in months.

3) Do you provide financial aid for either incoming or outbound students? Yes or No.

   If yes, please specify type of aid.

4) Does your program provide room and board? Yes or No.

4a) Room. If yes, specify

4b) Board. If yes, specify

5) Does your international host partner/s provide financial aid, room, and board for either incoming or outbound students? Yes or No

5a) Financial Aid. If yes, specify type of aid.

5b) Room. If yes, specify.

5c) Board. If yes, specify.

3.7.2 Category 2: Transatlantic Exchange

For questions six (6) through eleven (11), participants were asked to rank the item that best represented their opinion in the order of importance. The following 5-point Likert-type scale was used to rank the responses as very important; fairly important; neutral; somewhat not important; and not important.

Questions 6 through 9 focused on information related to future development of a transatlantic exchange program between laboratory sciences students and included questions about: possible program components; student evaluation and selection criteria; contributing factors for a successful exchange; and essential student skills needed for effective performance in an exchange program. These questions were designed to gain international consensus regarding future directions this researcher should consider in terms of developing a framework or model for a transatlantic education and training program as follows:

6) If a transatlantic exchange program between clinical laboratory sciences/medical

technology students and biomedical science students was developed, please rate each of the possible program components. Please rate each of the possible components. a) an on-line comparative health systems course; b) a laboratory course in one subject; c) bench training in a single rotation at a clinical laboratory; d) bench training in multiple rotations at a clinical laboratory; e) a research project; f) other

7) What criteria should be considered in the assessment and selection of qualified candidates for a transatlantic exchange? Please rate each criterion. a) excellent academic record; b) prior overseas experience; c) effective communication skills; d) completion of at least one year of coursework at home institution; e) enrolled in a training component of program at home institution; f) other.

8) What factors do you believe are important to conducting a successful transatlantic student exchange program? Please rate each factor a) institutional resources; b) clinical training sites resources; c) administrative support and involvement; d) tuition fee waiver policy for exchange students; e) an international student services office; f) other.

9) What basic skills do you think students need for optimum performance in a transatlantic exchange program? Please rate each skill. a) technical; b) information technology; c)management and leadership; d) critical thinking; e) linguistic capability; f) other.

Questions 10 and 11 dealt with barriers that could prevent institutions and students from participation in an education exchange program. The rationale for these questions was based on my desire to identify key barriers that prevent students and institutions of higher learning from considering participation in an international exchange opportunity. Questions 10 and 11 appear below.

10) Below is a list of potential barriers preventing higher education institutions from participating in student exchange programs. Please rate each barrier. a) lack of information; b) lack of institutional resources; c) lack of faculty commitment; d) lack of administrators commitment; e) tuition and residency policies; f) other.

11) Below is a list of barriers preventing students from participating in exchange programs. Please rate each barrier. a) lack of information; b) language requirements; c) lack of financial resources; d) credit recognition policies; e) visa/immigration requirements; f) other.

3.7.3 Category 3: International Professional Certification

Questions 12 and 13 were developed to explore the notion of international professional certification for qualified laboratory personnel and whether or not this notion was feasible given the existing climate of the laboratory profession in both the United States and overseas. These questions are presented below.

12) Do you think an international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists?

Yes and Why? Be specific. No and why not? Be specific.

13) What qualifications do you think clinical laboratory scientists/medical technologists/biomedical scientists should meet in order to be eligible for international professional certification? Indicate Yes or No a) pass respective certification/registration exam plus 3 years of work experience; b) pass respective certification/registration exam plus 2 years of work experience; c) only pass their respective national certification/state registration exam; d) other.

Questions 14 and 15 sought to determine the level of interest among laboratory program directors regarding whether or not British and American laboratory credentialing agencies should consider mutual credentialing for their constituencies and if so, how this could be accomplished or if not, why not? The rationales for these questions were based on the recommendation of the American Society of Clinical Pathology Board of Registry (ASCP-BOR). As previously indicated, the ASCP-BOR is currently exploring models to address globalization of its certification program. Questions 14 and 15 are presented below.

14) Do you think that the laboratory credentialing agencies in the United Kingdom and the United States should consider mutual credentialing for graduates of their respective accredited clinical laboratory sciences/medical technology/biomedical science programs? Yes or No

15) a) If yes, how do you see this being accomplished? b) if no, please state reasons

against.

Question 16 was designed to investigate the extent to which directors/liaison officers of clinical/biomedical science programs were interested in initiating international exchanges at their institution and potential host countries. Those that responded "yes" to this question were asked to identify the specific institutional partner/s and the target country or countries. Those that responded "no" to why they do not want to participate in international exchanges were asked to state the reasons why they didn't want to initiate an international exchange program. The rationale for this question is based on the lack of current information regarding laboratory program faculty/staff involvement, or potential interest, in international exchanges. As previously stated, I believe that information derived from the participants' responses could contribute to producing an expert consensus regarding the future direction of transnational education and training programs.

Question 16 is presented below.

16) Would you be interested in starting an international exchange program at your institution? a) if yes, specify target institutional partner/s and country/countries; b) if not, why not?

The final question provided survey participants with the opportunity to contribute comments or suggestions. The rationale for this was based on the notion that subject responses to this question could provide "added value" to this research and to the credentialing agencies that endorsed this project.

17) End comments.

3.8 Survey Distribution and Follow-Up

The survey questionnaire was distributed by e-mail on October 23, 2002. A follow-up reminder and replacement questionnaire was sent one week after the first e-mail to respondents who had not yet replied. The second follow-up reminder accompanied by another replacement questionnaire was sent to all non-respondents at the end of the third week. After approximately two months, another letter and questionnaire was sent as a third reminder to those who had not yet responded by this time period. I consulted again with my thesis committee and executive heads from the American Society for Clinical Pathology, Board of Registry (ASCP-BOR), the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), and the Institute of Biomedical Science (IBMS) to discuss other possible ways to maximize the response rate. Following these consultations, I decided to shorten the letter and re- format the questionnaire. This decision was based on a careful re-evaluation of the length and formats of the completed questionnaires that had been received. At the same time, the ASCP Board of Registry, NAACLS, and IBMS provided assistance by posting a notice on their websites or by sending an email message to their membership, encouraging participation in the survey.

The fourth and final reminder including the re-formatted questionnaire and new letter was sent to all those who did not respond after approximately seven months. In the final analysis, the follow-up methods used in this survey research contributed significantly to the positive outcomes.

The next chapter presents an in-depth discussion of the results gathered from this survey research including quantitative and qualitative data analyses.

Chapter 4

RESULTS

4.1 Introduction

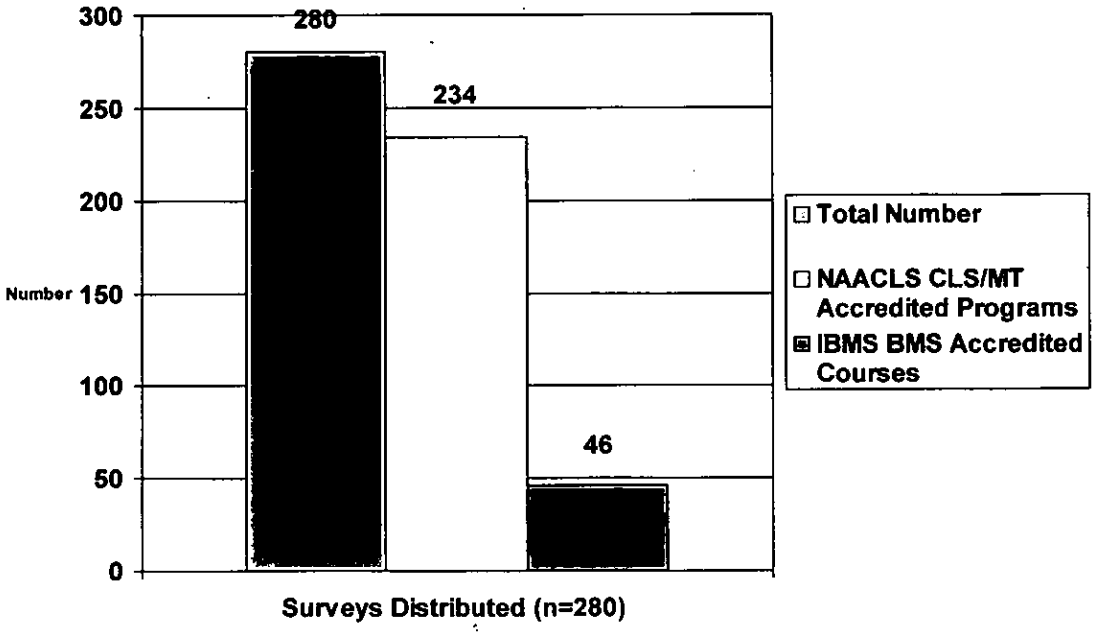
This chapter presents the results of the completed survey that was conducted as part of this research project. Evaluations of the findings are presented in Chapter 5. Both quantitative and qualitative methodologies were used to analyze the research findings. Statistical methods included the Chi-Square goodness of fit tests, the binomial test, and frequency distribution. Qualitative methods were influenced by Glaser and Strauss' coding and categorizing processes used in grounded theory (Glaser and Strauss, 1967). Data received from open-ended questions were coded quantitatively using content theme analysis in order to relate it to the quantitative data.

The survey questionnaire was sent to laboratory sciences programs (n=280) located across the United States, the United Kingdom, Malta, Sri Lanka, Ireland, Malaysia, Hong Kong and Australia. The representative countries were based upon the geographic regions in which the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) programs (n=234) and the Institute of Biomedical Science (IBMS) programs (n=46) reside (see Figure 4.1). It should be noted that throughout the results, response totals for questions vary because not all questions were answered by each of the respondents.

4.2 Verification of Information

For verification purposes, at the beginning of the survey questionnaire participants were asked to provide their name, affiliation, position/title, country, type of program (CLS/MT or BMS) and the number of students enrolled in their program. The survey assured respondents

Figure 4.1 Bar Graph Depicting Survey Distribution



National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)
Clinical Laboratory Science (CLS) Medical Technology (MT)
Institute of Biomedical Science (IBMS)
Biomedical Science (BMS)

Surveys were sent to 234 National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) Clinical Laboratory Science/Medical Technology-accredited programs and 46 Institute of Biomedical Science (IBMS)-accredited Biomedical Science courses. The total survey distribution was 280.

that their responses would remain confidential. According to Patten (2002) research subjects have a right to have the data collected from them as individuals kept confidential and the researcher has an obligation not to divulge the individuals' information to others, unless the identities of the respondents are disguised or made impossible to discern. Disguising information provided by respondents can be accomplished by using statistics, such as group averages.

4.3 Response Rates

Only 2 responses were returned after three weeks of launching the survey. Two more responses were received after the first reminder that yielded an early response rate of 1.4% (4 of 280). After the second reminder, 31 more responses were received increasing the response rate to 12.5% (35 of 280). Following the third reminder, 30 more responses were received yielding a response rate of 23.2 % (65 of 280) for the first half of the year. After consultation with my University of Central Lancashire doctoral committee, I then decided to re-format the questionnaire, re-send the survey to all non-respondents, and extend the deadline for an additional 6 months in order to ensure an optimal response rate for the survey. In addition, I consulted with executives from the American Society for Clinical Pathology (ASCP) Board of Registry and the Institute of Biomedical Science, who endorsed this research, and they agreed to post special notices on the ASCP and NAACLS websites. IBMS officials sent e-mails to encourage their constituencies to respond to the survey. These efforts yielded an additional 39 responses during the second half of the year. Thus, the total number of participating respondents was104, yielding a final overall response rate of 37.1% (104 out of 280); a 38.9% response rate (91 of 234)

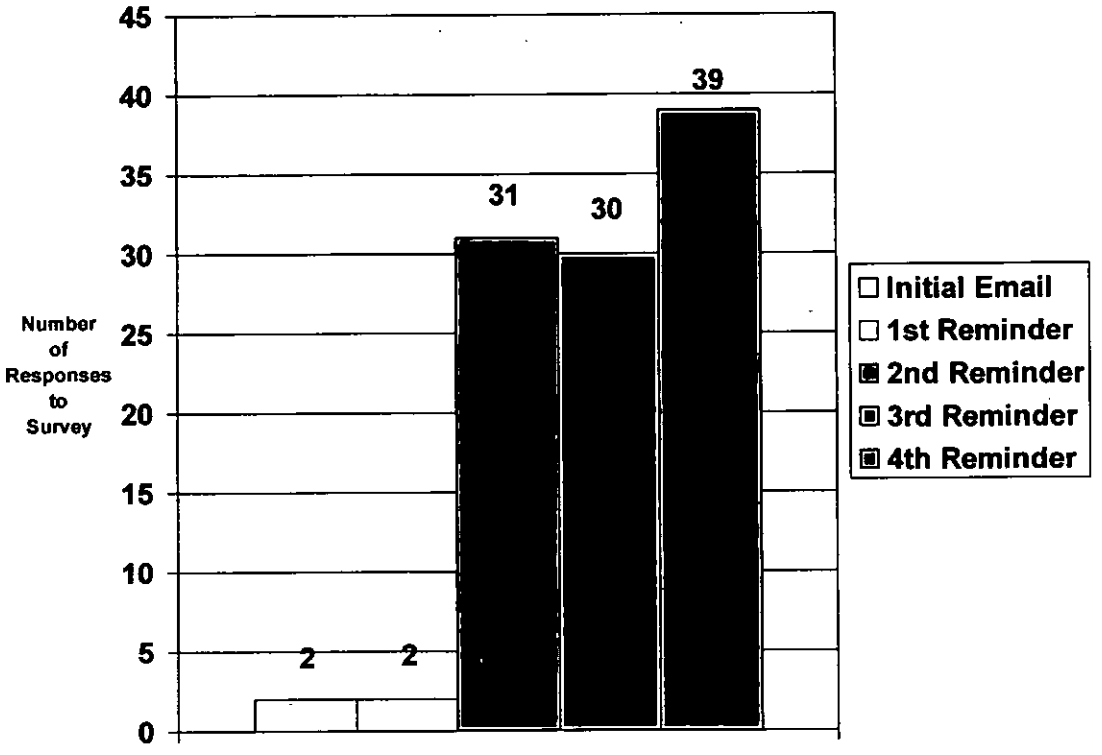
from the United States; a 32.4% response rate (12 of 37) from the United Kingdom; and a 100% response rate (1 of 1) from Australia. These response rates fall well within the typical response rate of 20 to 40 percent for mail surveys reported by Frankfort-Nachmias and Nachmias (2000) and, with the exception of the United Kingdom, they exceeded the mean response rate of 36.83% for e-mail surveys reported by Sheehan (www.ascusc.org/jcmc/vol6/issue2/sheehan.html).

Figure 4.2 details the sequence of responses that were received during the one-year survey period. Two responses were received at the outset, 2 additional responses followed the 1st reminder, 31 responses were received after the 2nd reminder, and 30 responses followed the 3rd reminder, yielding an initial response rate of 23.2% (65 of 280). Following the 4th reminder, 39 additional responses were received, resulting in an overall response rate of 37.1% (104 of 280).

Of the 234 United States programs surveyed, 91 completed the survey yielding a 38.9% response rate from the United States. In the United Kingdom and Australia, 13 of 46 programs completed the survey yielding the combined response rate of 28.3% (see Figure 4.3). Overall, 104 programs completed the survey, yielding an overall response rate of 37.1% (104 of 280). American Clinical Laboratory Science/Medical Technology programs are accredited by the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and United Kingdom and Australian Biomedical Science programs are accredited by the Institute of Biomedical Science (IBMS) (see Figure 4.4).

Table 4.1 categorizes the number of surveys completed by NAACLS - accredited/approved CLS/MT programs and IBMS- accredited BMS programs and

Figure 4.2 Initial Response and Subsequent Responses to Survey Reminders



Bar graph depicting the number of responses received initially and following periodic reminders during the survey period. The total number of responses received was 104.

Figure 4.3 Bar Graph Depicting Number Of Responses By Program Type

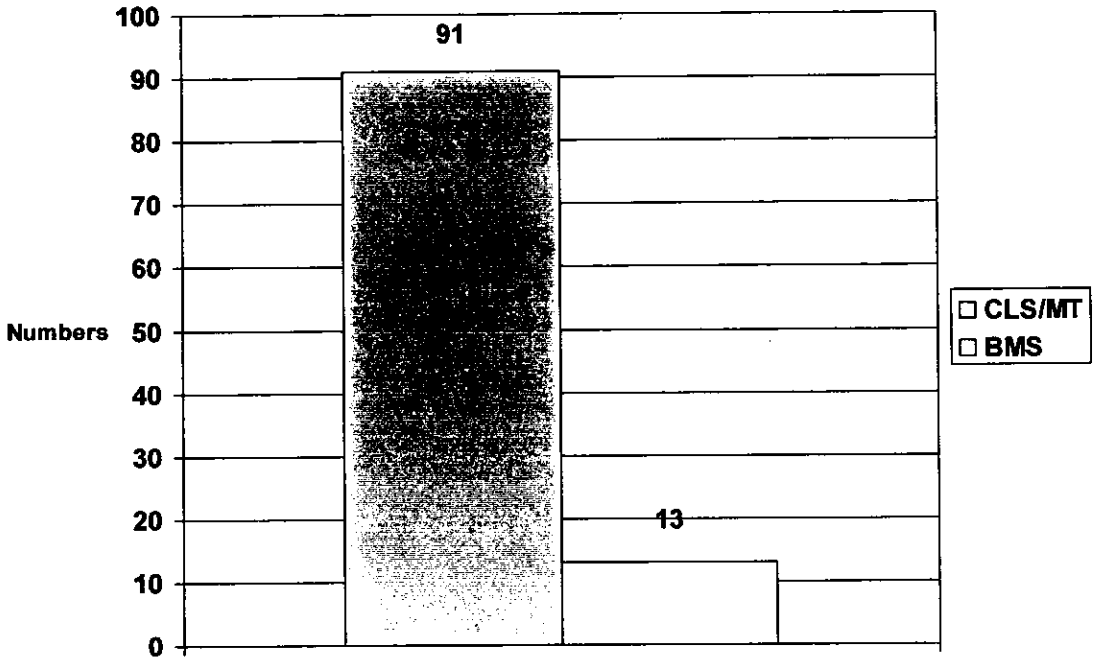


Figure 4.3 shows the number of surveys completed by Clinical Laboratory Science/Medical Technology programs (n=91) and Biomedical Science programs (n=13). Total number of responses was 104.

Figure 4.4 Bar Graph Depicting Categorical Survey Response Rates

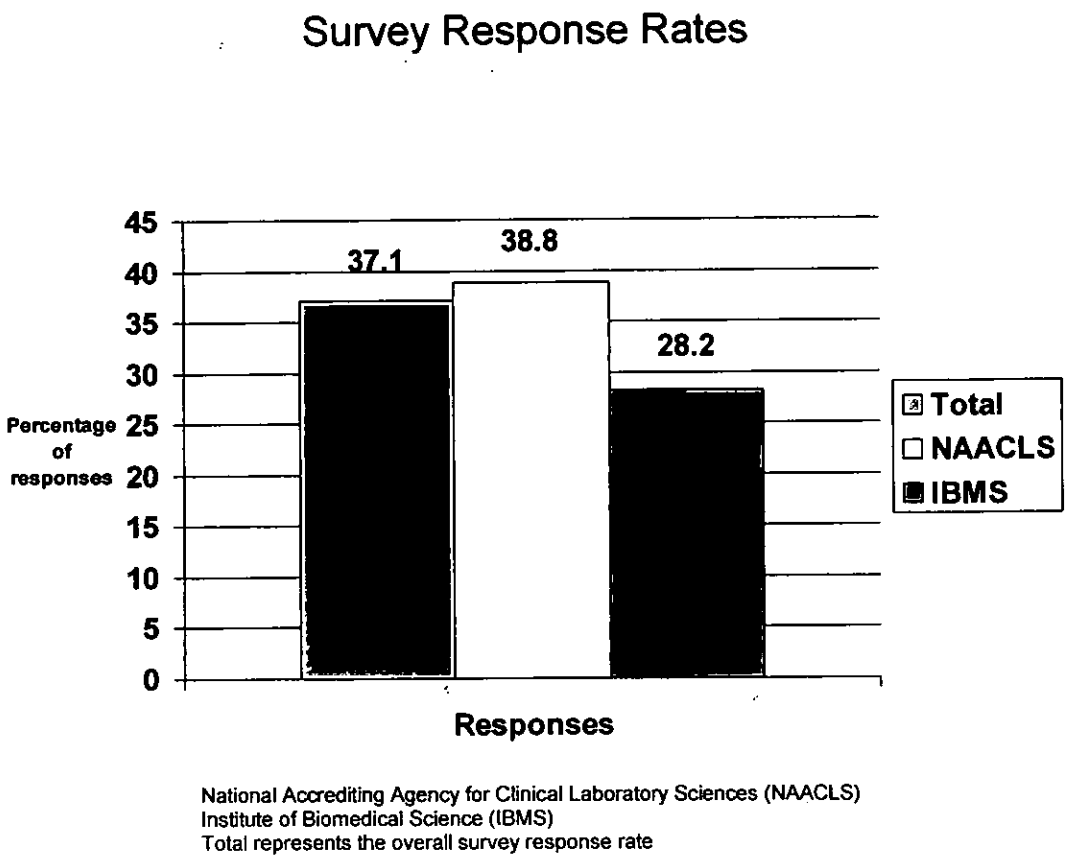


Figure 4.4 shows the survey response rates from programs accredited by the National Accrediting Agency for Clinical Laboratory Sciences (38.8%, 91/234) in the United States and those accredited by the Institute of Biomedical Science (28.2%, 13/46) in the United Kingdom and Australia. The number of surveys that were distributed was 280, of which the 104 were completed, yielding an overall response rate of 37.1% (n=104/280). NAACLS accredited program in the United States completed 91 of 234. IBMS programs in the United Kingdom and Australia completed 13 of 46.

Table 4.1 Categorical Survey Response Rates

Program Type	Number Distributed	Number Completed	Percentage Response Rate
NAACLS Accredited & Approved CLS/MT Programs	234	91	38.8 %
IBMS Accredited BSc(Hons) Biomedical Sciences Courses	46	13	28.2 %
Totals	280	104	37.1%

Table 4.1 categorizes the number of respondents, by program type, who fully completed the survey questionnaire. In total, 37.1% (104/280) of the programs completed the survey, of which 38.8% of the respondents (91 of 234) were from the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) programs and 28.2% (13 of 46) were from the Institute of Biomedical Science programs.

response rates by program type. Table 4.1 indicates that 38.8 % (91 of 234) CLS/MT programs in the United States completed the survey, whereas 28.2% (13 of 46) of non-United States Biomedical Science programs responded, yielding an overall response rate of 37.1 % (104 of 280).

4.4 Demographic Information

Pertinent demographic information consisted of gender, academic degree, job title, work setting, professional credentials, geographic region, and student enrollments. Table 4.2 categorizes demographic data for gender, degree, work setting, credentials, and job title according to country of origin.

In terms of gender, 73.1% (76 of 104) of the respondents were female, and 26.9 % (28 of 104) were male; 87.5% (91 of 104) of the respondents had an advanced degree at the Masters or doctorate levels, while 12.5 %(13 of 104) possessed undergraduate degrees. The majority of respondents (67.3%) were based at universities/academic health centers and 32.7% were employed at hospitals/health systems. All United Kingdom and Australian respondents were university-based. In the category of credentials, all United States respondents (n =91) held generalist certification as a medical technologist [MT(ASCP)] from the American Society for Clinical Pathology (ASCP) Board of Registry and/or certification as a clinical laboratory scientist [CLS (NCA)] from the National Credentialing Agency; 16.5% (15 of 91) held both the generalist CLS/MT and another ASCP certification in either Microbiology, Hematology, Chemistry or Immunohematology; and approximately 2 percent (2 of 91) United States respondents

Table 4.2 Demographic Data by Country

Category	US Respondents N=91	UK & Australia Respondents N=13	Total Number N=104	Percentage of Respondents
Gender				
Male	18	10	28	26.9%
Female	73	3	76	73.1%
Academic Degree				
Undergraduate (Baccalaureate)	12	1	13	12.5%
Graduate (Masters)	53	0	53	51.0 %
Post-graduate (Doctorate)	26	12	38	36.5 %
Work Setting				
College/University/Academic Health Center	57	13	70	67.3%
Hospital/Health System	34		34	32.7%
Credentials				
Generalist	91		91	87.5%
Both Generalist and Specialist	15		15	16.5%
Diplomate	2		2	2.2%
Associate/Fellow		4	4	3.8%
Job Title				
Liaison Officer		6	6	5.7%
Education Coordinator	2	2	4	3.8%
Program Director	79	1	80	76.9%
Clinical Instructor	1		1	0.96%
Other	9	4	13	12.5%

The above table lists demographic information about the survey respondents including their gender, highest earned academic degree; the setting in which they work; the credentials that they have in terms of certification; and their job titles. The demographic data are categorized by country and described in section 4.4. The combined total number of respondents in each category and the percentage of respondents represented by each category appear in the last two columns on the right hand side of the table.

were ASCP Diplomates in Laboratory Management [DLM(ASCP)]. Four United Kingdom/Australians were Associates (AIBMS) or Fellows (FIBMS) of the Institute of Biomedical Science. Over 75 % of the total respondents (80 of 104) were program directors.

4.5 Response Rates by United States Geographic Regions

Table 4.3 delineates survey responses by United States geographical regions and the states located within each of the five regions. The United States regions have been categorized as follows: the North-east, North-west, Mid-west, South-west, and South-east. The District of Columbia and Puerto Rico, both US territories, are listed separately. The Northeastern states (n=13) and Midwestern states (n=13), represent the largest aggregate of states (26 of 50) or 52% of the United States. The Southern region includes 18 states, of which 11 are located in the South-east and 7 in the South-west. The North-west with 6 states is the smallest region. The response to this survey illustrates representation from all US geographic regions. Response rates in the Northern region ranged from 28.6% in the North-west to 47.2% in the North-east. However, the average rate of 45.2% (28 of 62) from the Northern region was higher than the average response rate for the Southern region which was 33.7% (29 of 86). In the Mid-west, the response rate was 40.3% compared to that of the District of Columbia (25%) and Puerto Rico (40%) which had an average response rate of 32.5%.

Table 4.3 Categorical Response Rates by United States Geographic Regions

Geographic Region	States & Territories	Number of NAACLS-accredited CLS/MT Programs	Number of Programs that Responded	% Response Rate
North-east	ME, VT, NH, NY, MA, RI, CT, PA, NJ, DE, MD, WV, VA	55	26	47.2%
North- west	AK, WA, OR, ID, MT, WY	7	2	28.6%
Mid- west	ND, MN, WI, MI, SD, NE, IA, IL, IN, OH, KS, MO, KY	77	31	40.3%
South- west	CA, NV, UT, AZ, CO, NM, HI	18	7	38.9%
South -east	TX, OK, AR, TN, NC, SC, LA, MS, AL, GA, FL	68	22	32.4%
District of Columbia	DC	4	1	25%
Puerto Rico	PR	5	2	40%
Totals		234	91	Total 38.9 %

The above table lists the United States geographical distribution of respondents according to the regions in which their programs reside. Abbreviations of states are listed below.

North-east: ME=Maine; VT=Vermont; NH=New Hampshire: NY=New York; MA=Massachusetts; RI=Rhode Island; CT=Connecticut; PA=Pennsylvania; NJ=New Jersey; DE=Delaware; MD=Maryland; WV=West Virginia; VA=Virginia; DC=District of Columbia

North-west: AK=Alaska; WA=Washington; OR=Oregon; ID=Idaho; MT=Montana, WY=Wyoming

Mid-west: ND=North Dakota; MN=Minnesota; WI=Wisconsin; MI=Michigan; SD=South Dakota; NE=Nebraska; IA=Iowa; IL=Illinois; IN=Indiana; OH=Ohio; KS=Kansas; MO=Missouri; KY=Kentucky

South-west: CA=California; NV=Nevada; UT=Utah; AZ=Arizona; CO= Colorado NM=New Mexico; HI=Hawaii

South-east: TX=Texas; OK=Oklahoma; AR=Arkansas; TN=Tennessee; NC=North Carolina; SC=South Carolina; LA=Louisiana; MS= Mississippi; AL=Alabama; GA=Georgia; FL=Florida

US Commonwealth: DC=District of Columbia; PR=Puerto Rico

4.6 Categorical Response Rates from the United Kingdom and Australia

Survey responses from programs located outside of the United States were from the United Kingdom and Australia. Table 4.4 indicates a 32.4% response rate from the United Kingdom, which is somewhat lower than the 38.8% rate of response from the United States. Although the number of United Kingdom programs (n=37) is much smaller than that of the United States (n=234), these rates appear to be comparable and representative of each group.

4.7 Student Enrollments

National data were not available on student enrollments in laboratory sciences programs in the United Kingdom, the United States, and Australia. However, based on the data provided by the respondents from these countries, the average number of students enrolled in the laboratory science programs surveyed was provided. Figure 4.5 presents the combined student enrollments in the United Kingdom, United States, and Australian programs and Figure 4.6 presents the average number of students enrolled in the programs surveyed. Nineteen programs reported a student enrollment of 5 or less; twenty three programs have 6 to 10 students; thirteen programs have 11 to 15 students in their program; two programs have 16 to 20 students; whereas the remaining forty seven have more than 20 students enrolled in their programs.

4.8 Existing Program Information

The first category of the questionnaire pertained to existing program information. Participants were asked if their program had an international exchange program. The extent to which clinical laboratory science/medical technology (CLS/MT) programs and Biomedical Science (BMS) programs participate in international education exchanges is very minimal. Table 4.5 demonstrates that only 11 of 104 (5 United States and 6 United Kingdom/Australian programs) or 10.6% of the programs surveyed participate in international education exchanges of faculty and students. It is notable that only 5.5% (5 of 91) of CLS/MT programs in the United States participate in international education exchanges; whereas 46.2 % (6 of the 13) of BMS programs in the United Kingdom and Australia are involved in international exchanges. Given that laboratory science curricula must strictly adhere to accreditation/certification essentials mandated by laboratory credentialing agencies and licensure requirements exerted by the government, it was not surprising that very few United States programs participated in international exchanges.

The data that follows provides valuable insight to laboratory program educators and administrators about institutional and student barriers that inhibit clinical/biomedical science students and faculty from participating in international educational exchange programs.

Table 4.4 Survey Responses by Non-United States Regions

Regions	Number of IBMS-accredited BSc (Hons) Biomedical Science Programs	Number of Programs that Responded	Percent Response Rate
United Kingdom (England, Scotland, Northern Ireland, and Wales)	37	12	32.4%
Australia	1	1	100%
Totals	46	13	28.2%

This table lists the geographical distribution of respondents from outside of the United States according to program location.

Figure 4.5 Bar Graph Depicting the Combined Student Enrollments in the United States, the United Kingdom, and Australian Programs (n=104)

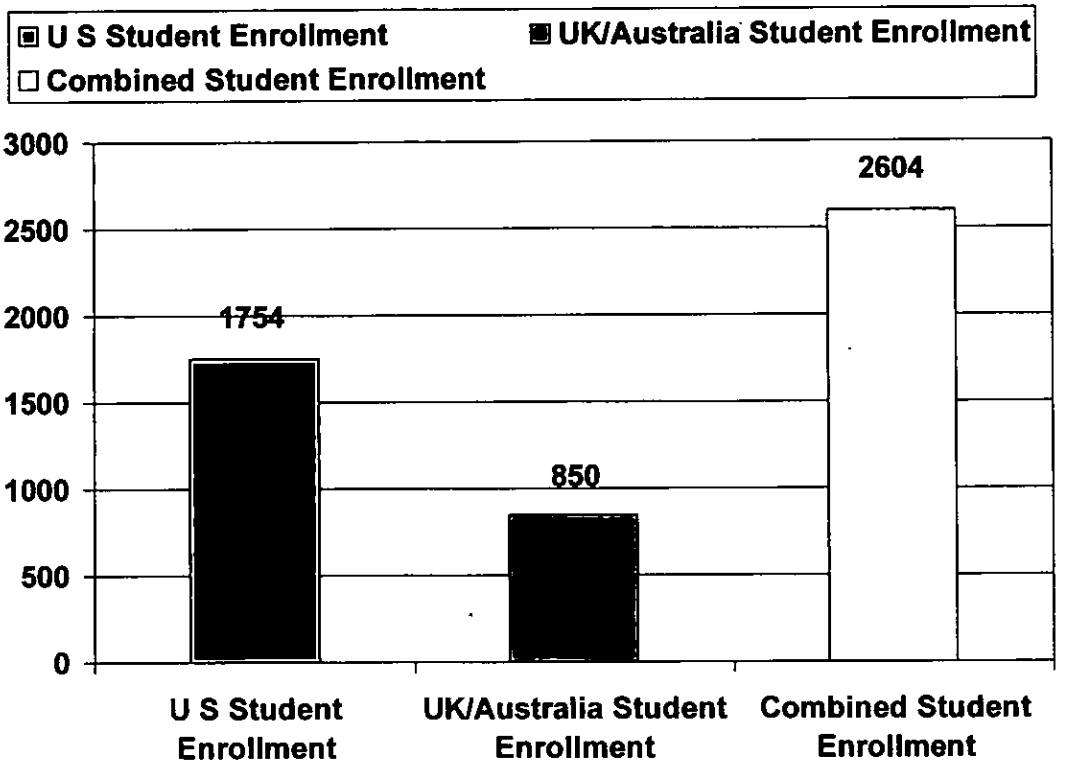
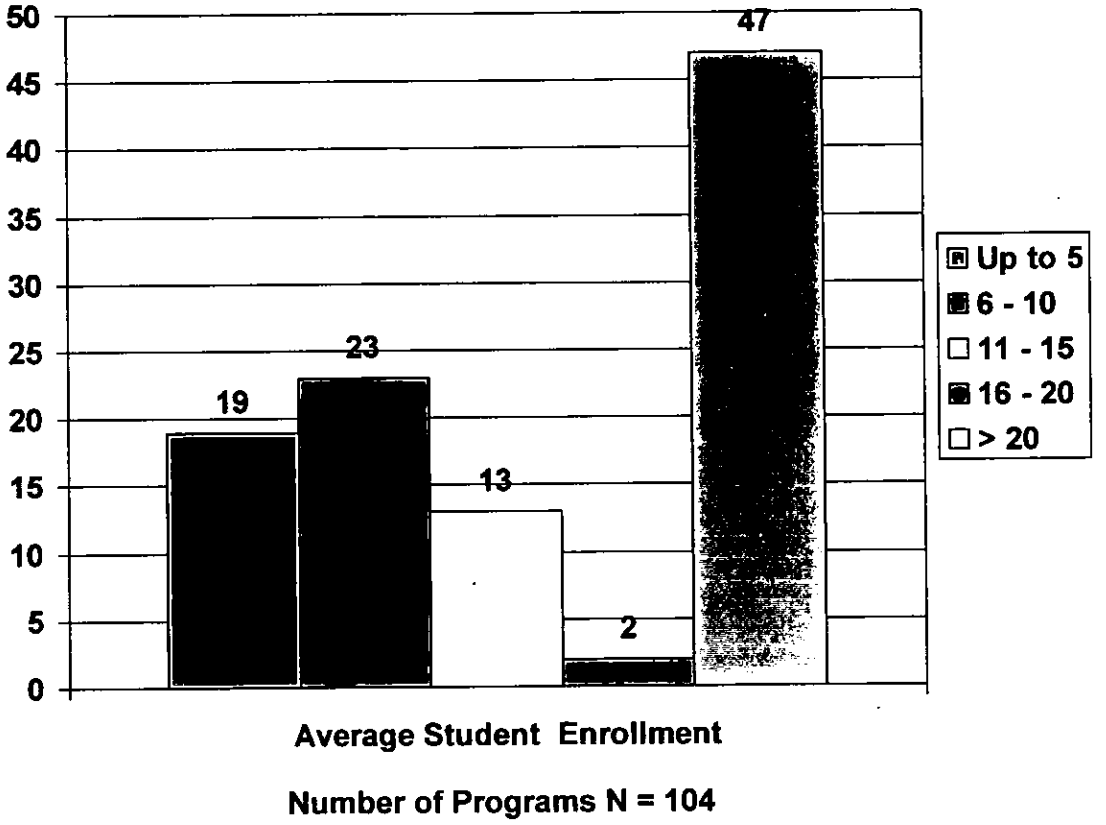


Figure 4.5 This bar graph depicts the total number of students enrolled in the Clinical/Biomedical Science Programs (n=104). Also included are student enrollments by country.

Figure 4.6 Bar Graph Depicting the Average Number of Students/Per Program Among The Clinical/Biomedical Science Programs



Out of the 104 Clinical/Biomedical Science Programs, 18.2% of the programs (19 of 104) enroll an average of 1-5 students; 22.1 % of the programs (23 of 104) have 6-10 students; 12.5% of programs (13 of 104) have 11-15 students; less than 2% of programs (2 of 104); and 45% of the programs (47 of 104) have more than 20 students enrolled.

Table 4.5 CLS/MT and BMS Programs Participating in International Education Exchanges

International Exchanges	Yes	No	Total # Respondents	Percentage of Programs with Exchanges
United States	5	86	91	5.5 %
United Kingdom & Australia	6	7	13	46.2%
Total	11	93	104	10.6%

The above table shows the number and percentage of programs that are actively engaged in international exchanges.

4.9 International Exchange Program Information

Respondents were asked to provide information about their international exchange program including: the name of the host institution/s; the name of the host country/countries; the overall number of students and faculty exchanged; and the average length of the exchange period in months (see Table 4.6 for details). Of the eleven international exchange programs that were identified, respondents named as few as seventeen countries worldwide that were participating in their international education exchanges of clinical/biomedical science students and/or faculty. Those countries that are engaged in active international exchanges with the United States, United Kingdom, and Australian laboratory sciences programs included: Australia, Brazil, China, Denmark, England, Finland, France, Greece, Iceland, Ireland, Japan, Northern Ireland, Norway, Scotland, Sweden, the United States and Wales. Respondents also reported that 186 students and 17 faculty members have participated in their international exchanges.

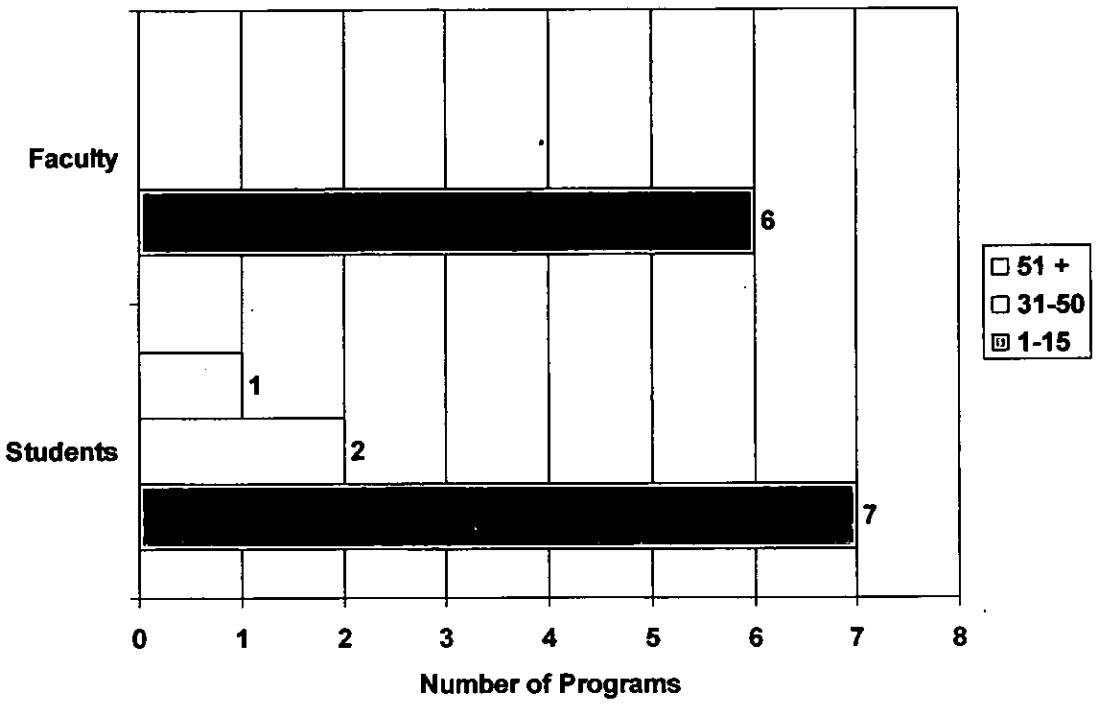
Programs surveyed reported that their length of exchange periods ranged from one month to 24 months or 2 years. However, descriptive information about the nature of the international exchange or program information of the host institutions was not reported. Figure 4.7 shows that six of 11 programs reported between 1 and 15 faculty/staff participated in their international exchange programs. One program reported that over 51 students participated in their exchange program; two programs exchanged between 31 and 50 students; and seven programs exchanged between 1 and 15 students.

Table 4.6 International Exchanges by Location, Participants, and Length of Stay

Location of Home Institution	Location of Host Country/Countries	Total Number of Students Exchanged	Total Number of Faculty/Staff Exchanged	Length of Exchange Period (in months)
US	Australia, Brazil, Japan, Iceland, China, UK, Norway	68	6	1 to 24
UK	France, Finland, Denmark, Greece, Sweden, US	112	11	3 to 8
Australia	UK, Northern Ireland, Sweden	6	0	9
Totals (where applicable)	14	186	17	

The above table categorizes international exchange information by program location, host countries, numbers of students and faculty/staff who have participated in such exchanges and the average time of the exchange program.

Figure 4.7 Faculty/Staff and Student Participation in International Exchange Programs (n=11)



Number of Programs & Number of Participants (1-15; 31-50; >51)

Figure 4. 7 presents a graphic representation of the number of programs involved in international exchanges (n=11) and the number of students and faculty engaged in these programs. Participant levels ranged from: 1-15; 31-50; and 51 or more.

4.10 Financial Aid

Respondents were asked to provide information about financial aid for incoming or outbound students that participate in their international exchange program. The types of financial aid available to those students who participated in international exchange programs appear in Table 4.7 at the end of this section. Respondents reported the following information related to financial aid. Firstly, they indicated that American students were eligible to apply for travel grants, but did not receive financial assistance for participating in international education exchange programs, whereas Australian students were reported to have received a modest stipend from their home institution or had a reciprocal fee arrangement with their home and visiting institutions. Secondly, British students were reported to have received aid from the Erasmus program. Erasmus, an acronym for European Community Action Scheme for the Mobility of University Students, is the European Commission's education program for higher education students, instructors and institutions. Introduced in 1987, Erasmus aims to increase student mobility within the European Community, and subsequently in the European economic area countries and the associated countries of eastern and central Europe, Malta, and Cyprus.

Table 4.7 Types of Student Financial Aid

Country	Type of Financial Aid
US	Travel grant
UK	Socrates-Erasmus grants, reciprocal fee arrangement
Australia	Stipend, reciprocal fee arrangement

The above table lists the different types of financial aid available to exchange students from the United States, the United Kingdom, and Australia.

In the mid 1990s, Erasmus became incorporated into the Socrates program which covers education from school to university to life long learning. The Socrates-Erasmus program includes student and faculty mobility as well as curriculum development. This relatively new program is based on cooperation agreements between institutions of higher learning in the various participating states (http://www.erasmus.ac.uk, accessed August 16, 2003). In all of this, it appears that the lack of opportunities for financial aid is a key barrier for students who may be willing to participate in an exchange program, but who may not be able to afford the fees associated with this type of program.

4.11 Housing Accommodation

Information regarding room and board was in response to questions that solicited information about both the institutional program and that of the international host partner/s. Course leaders from programs in the United Kingdom reported that campus housing or private homes were provided to students by their international host partner institutions. Whereas United States respondents indicated that their students received financial support via a travel grant, scholarship, and/or a stipend from their international host partner's institution. Figure 4.8 demonstrates that 36% (4 of 11) of the programs provide financial aid and housing, while only 18% (2 of 11) of the programs provide board.

United Kingdom respondents also indicated that their international host partner did provide campus housing, but did not provide financial aid to United Kingdom students participating in their international education exchange program. The Australian and United States programs reported that their students did not receive room or board

Figure 4.8 Bar Graph Depicting Programs That Offer Financial Aid and Accommodation

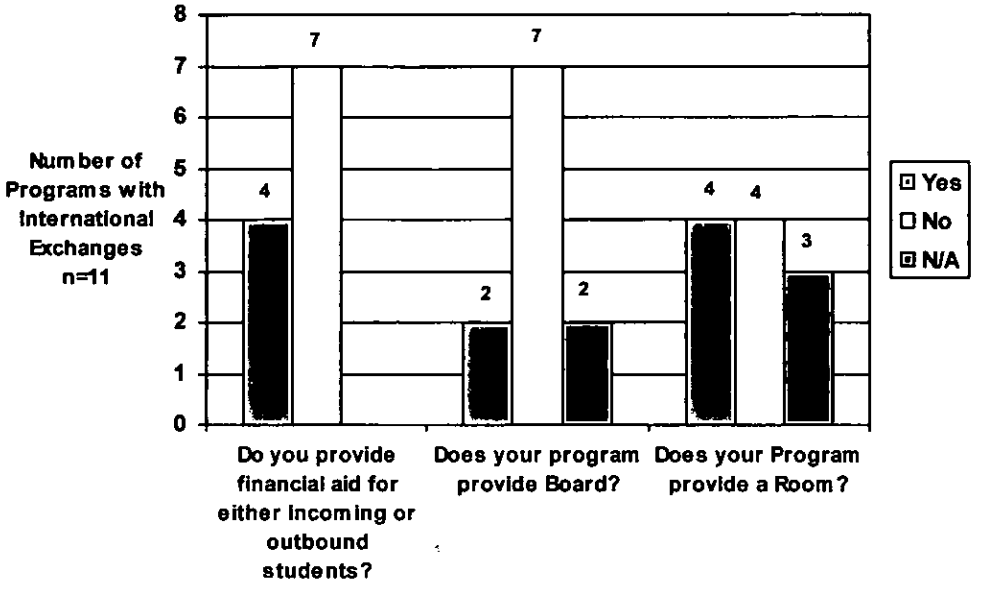


Figure 4.8 shows the number of international exchange programs (n=11) and the number of those programs that provide financial aid (4/11), room (4/11), and board (2/11).

accommodations. Once again, students may have wanted to participate in an international exchange program, but were unable to due to lack of provision for accommodations by their home institution.

4.12 Transatlantic Exchange Information

The following information is related to various aspects of a potential transatlantic exchange between clinical laboratory sciences/medical technology and biomedical science students. Information requested in the "Transatlantic Exchange" section of the survey included the following categories: possible course components; perceived student eligibility criteria; perceived factors for success; perceived basic student skills; potential institutional and student barriers. Each of the categories listed above provided 6 choices; five of which were specified; and the last item choice was designated as "other." The categories and choice items are listed in Table 4.8. Respondents chose 1 of the following 5 responses: very important, fairly important, neutral, somewhat not important, and not important. In a recent report, scores obtained by this type of rating scale are valid (Ward Cook, Surges Tatum, and Jones, 2000). For clarity purposes, responses were then grouped together and re-classified into the following three groups: very important and fairly important = "*important*;" neutral remained the same = "*undecided*;" and somewhat not important and not important = "*not important*."

As previously stated in Chapter 2, responses that fell at or below the midpoint (2.5) were considered positive and important. Responses that fell above 2.5 were considered not important. The statements made by all the

Table 4.8. Considerations for a Transatlantic Exchange Program

Program Components

An on-line comparative health systems course
A laboratory course in one subject
Bench training in a single rotation at a clinical laboratory
Bench training in multiple rotations at a clinical laboratory
A research project

Student Assessment and Selection Criteria

Excellent academic record
Prior overseas experience
Effective communication skills
Completion of at least 1 year of coursework at home institution
Enrolled in a training component of program at home institution

Factors for a Successful Exchange

Institutional resources
Clinical training sites resources
Administrative support and involvement
Tuition fee waiver policy for exchange students
An international student services office

Student Skills for Optimum Performance in Exchange

Technical
Information Technology
Management and leadership
Critical Thinking
Linguistic capability

Institutional Barriers

Lack of information
Lack of institutional resources
Lack of faculty commitment
Lack of administrators' commitment
Tuition and residency policies

Student Barriers

Lack of information
Language requirements
Lack of financial resources
Credit recognition policies
Visa/immigration requirements

The above table lists categorical information related to a transatlantic exchange program, with choice items in each category, that respondents were asked to rate on a 5-point scale with endpoints very important (1) and not important (5). These are discussed in sections 4.13 to 4.18.

subjects on a particular topic were compared with one another and comparable statements were compiled into categories/major themes and are reported along with salient points made by subjects on the particular topic.

4.13 Program Components

Participants were asked to rate each of five possible program components of a potential transatlantic exchange program. Ratings were based on 5-point scales with endpoints *very important* (1) and *not important* (5). Components included: a) an online comparative healthcare systems course; b) a single subject laboratory course; c) training in a single laboratory rotation; and d) training in multiple laboratory rotations. Also, subjects were given the opportunity to e) specify and rate components other than those listed. With the exception of bench training in a single rotation at a clinical laboratory and a research project, all other components (bench training in multiple rotations at a clinical laboratory (1.8 out of 5); a laboratory course in one subject (2.4 out of 5); and an on-line comparative health systems course (2.4 out of 5) were positive responses (very important/fairly important) and are statistically significant. Figure 4.9 illustrates the respondents' average ratings for each of the exchange program components. Of the five choice items, respondents most frequently cited "bench training in multiple lab rotations" as an important component (82.7%, 86/104), followed by "a laboratory course in one subject" (62.5%, 65/104); and "an on-line comparative health systems course" (58.7%, 61/104). Of lesser importance was "bench training in a single lab rotation" (47.1%, 49/104) and "a research project" (39.4%, 41/104). Table 4.9 provides more details. The categories/major themes that developed for program components along with salient points from the completed questionnaires

Table 4.9 Frequency of Program Components

Respondents (n=104)						
Component	Important		Undecided		Not Important	χ^2
	n	%	n	%	n	%	
An on-line comparative health systems course	61	58.7	22	21.1	12	11.5	44.04
A laboratory course in one subject	65	62.5	19	18.3	12	11.5	55.35
Bench training in a single lab rotation	49	47.1	25	24.0	20	19.2	18.77
Bench training in multiple lab rotations	86	82.7	5	4.8	7	6.7	186.42
A research project	41	39.4	30	28.8	27	26.0	22.58

A frequency distribution of scores, from important to not important, for each component of a proposed transatlantic student exchange program. Program component ratings are on 5-point scales with endpoints *very important* (1) and *not important* (5).

Note: All chi - square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Figure 4.9 Bar Graph Depicting Rating Scale of Program Components (n=104)

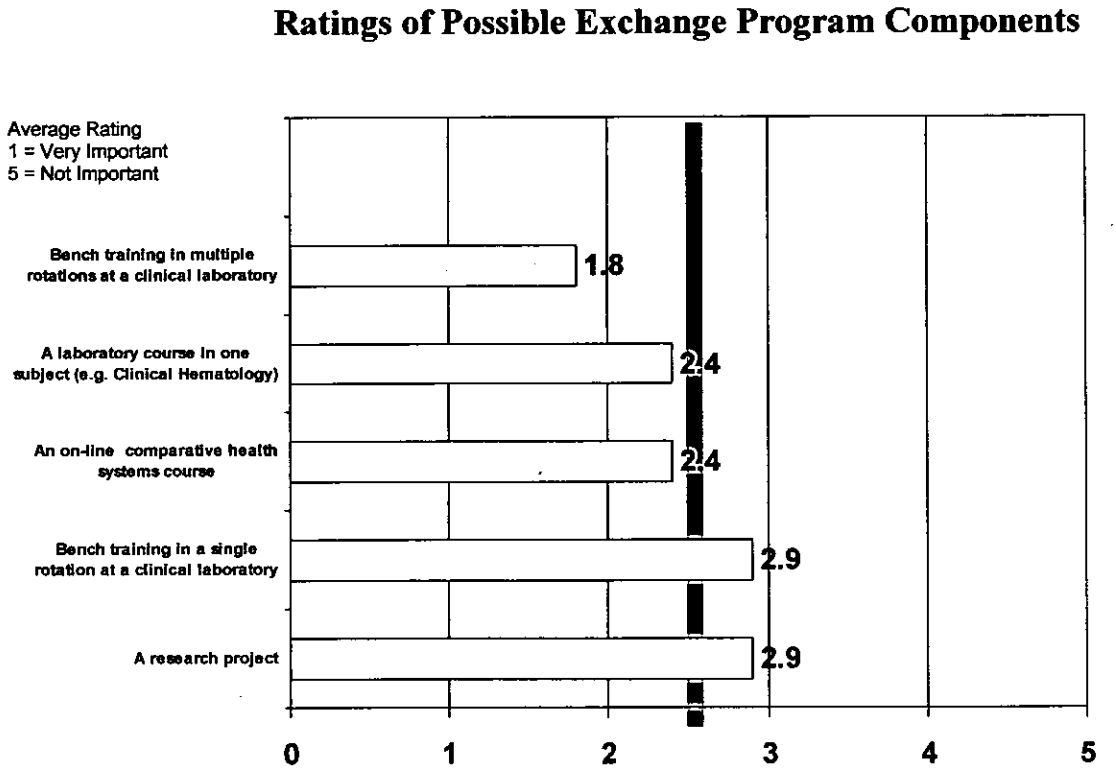


Figure 4.9 displays the average rating of each program component. Possible exchange program components are on 5-point scales with endpoints *very important* (1) and *not important* (5). The midpoint is 2.5. The red vertical line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered by the respondents to be important. Ratings that fall above the midpoint (>2.5) are considered to not be important.

are identified in Table 4.10. Respondents' statements developed into the following categories: continuity of coursework, multidisciplinary approach, and skills and competencies.

4.15 Student Assessment and Selection Criteria

Participants were asked to rate criteria to be used to assess and select qualified candidates for a potential transatlantic exchange program. Ratings were on 5-point scales with endpoints *very important* (1) and *not important* (5). As shown in Figure 4.10 respondents' average ratings for each criterion were as follows: effective communication skills (1.5); excellent academic record (1.6); completion of at least one year of coursework at home institution (1.9); enrollment in a training program (2.3); and prior overseas experience (3.6). With the exception of "prior overseas experience," all other assessment/selection criteria were positive and statistically significant. Of the five choice items, respondents most frequently cited "effective communication skills" (93.3%, 97/104); "excellent academic record" (90.4%, 94/104);

Table 4.10 Categories/Major Themes for Program Components and Salient Points

CATEGORY/MAJOR THEMES	SALIENT POINTS
CONTINUITY OF COURSEWORK	Correlate lab rotations with lectures
MULTIDISCIPLINARY APPROACH	Courses & training are needed in all clinical subjects (e.g. Chemistry, Microbiology, Hematology, Blood Bank, etc.)
SKILLS & COMPETENCIES	Provide research opportunities; emphasize ethics, information technology, problem solving & decision making

Major themes taken from respondents' statements about components of a transatlantic exchange program. Salient points are from fully completed questionnaires only.

Figure 4.10 Bar Graph Depicting Average Rating for Student Assessment and Selection Criteria (n=104)

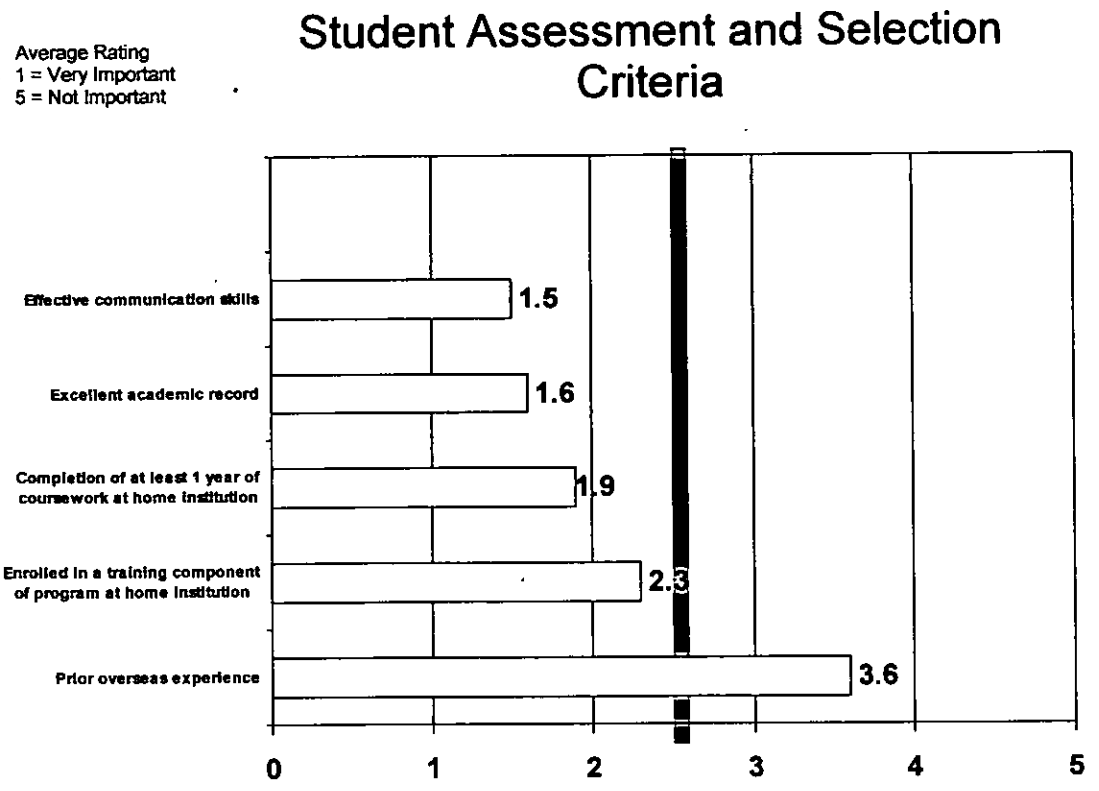


Figure 4.10 displays the average ratings for student assessment and selection criteria. Possible student assessment and selection criteria are on 5-point scales with endpoints *very important* (1) and *not important* (5), with 2.5 as the midpoint. The red vertical line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered to be important. Ratings that fall above the midpoint (>2.5) are considered to not be important.

and "completion of at least 1 year of coursework at home institution" (78.8%, 82/104) as their top three items of importance. Of lesser importance was "enrolled in a training component of program at home institution" (67.3%, 70/104); and "prior overseas experience" (14.4%,15/104) was cited most as not important (see Table 4.11 for more details). Table 4.12 outlines five major categories that developed from the respondents' statements regarding "other" assessment/selection criteria. They include: immigration status; prerequisites; language proficiency skills; and adult attributes.

Table 4.11 Frequency of Student Assessment and Selection Criteria

Respondents (n=104)								
Student Assessment & Selection Criteria	Important		Undecided		Not Important		χ^2
	n	%	n	%	n	%	
Excellent academic record	94	90.4	6	5.8	1	.96	123.17
Prior overseas experience	15	14.4	35	33.7	51	49.0	52.46
Effective communication skills	97	93.3	3	2.9	2	1.9	196.00
Completion of minimum of 1 year of coursework at home institution	82	78.8	12	11.5	4	3.8	85.90
Enrolled in a training component of program at home institution	70	67.3	17	16.3	9	8.7	60.77

A frequency distribution of scores, from important to not important, for student assessment and selection criteria to be used for a proposed transatlantic student exchange program. Student assessment and selection criteria ratings are on 5-point scales with endpoints *very important* (1) and *not important* (5). All chi-square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Table 4.12 Categories/Major Themes for Student Assessment and Selection Criteria and Salient Points

CATEGORIES/ MAJOR THEMES	SALIENT POINTS
IMMIGRATION STATUS	Possess a current active VISA
MEET PREREQUISITES	Complete all clinical courses before going overseas
LANGUAGE PROFICIENCY	Good command of the English language
SKILLS	Skillful in information technology, lab practice, and problem-solving
ADULT ATTRIBUTES	Maturity and independence

Major themes taken from respondents' statements about student assessment and selection criteria for a transatlantic exchange program. Salient points are from fully completed questionnaires only.

4.15 Factors for a Successful Exchange

Subjects were asked to rate factors that they deemed important for conducting a successful transatlantic student exchange program and to specify and rate other important factors not identified in the list. Ratings were on 5-point scales with endpoints *very important* (1) and *not important* (5). Respondents' average ratings for factors are listed in rank order as follows: "clinical training sites resources" (1.4); "institutional resources" (1.5); administrative support and involvement (1.5); "an international student services office" (2.0); and "tuition waiver policy for exchange students" (2.7) (see Figure 4.11).

Figure 4.11 Bar Graph Depicting Average Ratings of Factors for a Successful Exchange (n=104)

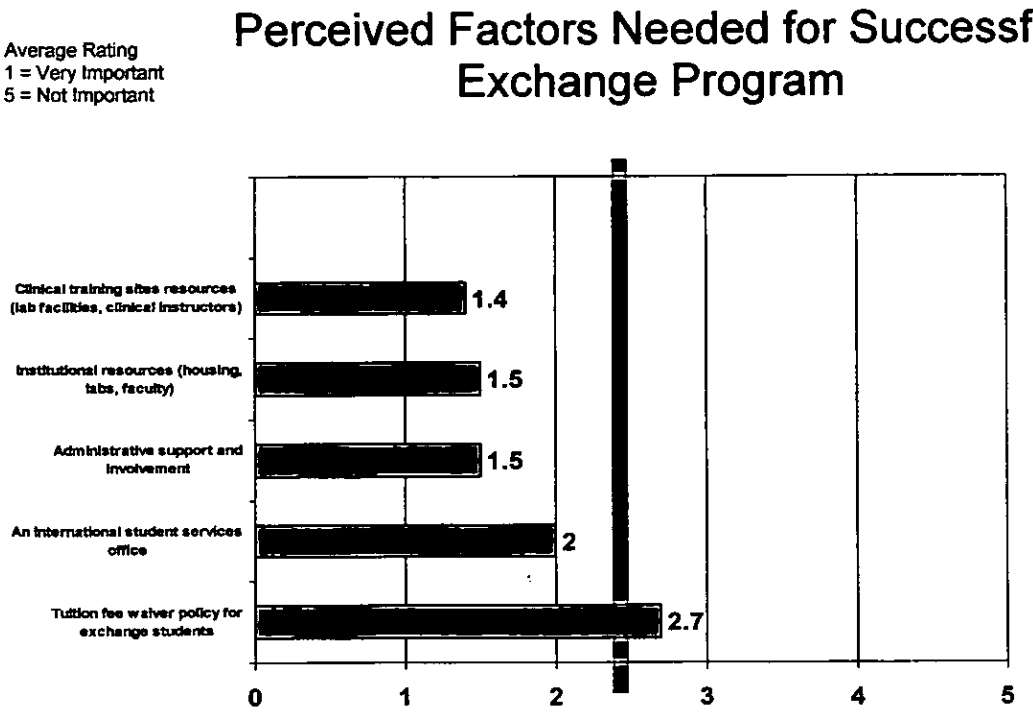


Figure 4.11 displays the average ratings for perceived factors needed to conduct a successful exchange program. Factors are on 5-point scales with endpoints *very important* (1) and *not important* (5), with 2.5 as the midpoint. The red vertical line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered important. Ratings that fall above the midpoint (>2.5) are considered not important.

Frequency of factors needed for a successful exchange is detailed in Table 4.13. Four of the five item choices were the most frequently cited factors. Over ninety percent of the respondents' rated "clinical training sites resources" (93.3%, 97/104); "administrative support and involvement" (92.3%, 96/104); and "institutional resources" (91.3%, 95/104) as primary factors needed for a successful exchange. More than three-quarters of the respondents rated "an international student services office" (77.9%, 81/104) as very important/fairly important, while half of the respondents rated "tuition fee waiver policy for exchange students" (50%, 52/104) as very important/fairly important. Insurance, strong links, memorandum of understanding, and equivalency were the major themes that developed for this topic (see Table 4.14 for more details).

4.16 Basic Student Skills

Subjects were asked to rate each basic skill that they believed students needed to perform optimally in a transatlantic exchange program and to comment and rate other choices that were not provided. Ratings were on 5-point scales with endpoints *very important* (1) and *not important* (5). Figure 4.12 provides the respondents' average ratings in their order of importance for student skills needed for optimal performance in an international exchange program as follows: critical thinking (1.6); technical (1.7); information technology (1.8); linguistic capability (1.8); and management and leadership (2.6). Interestingly, four of the five choice items mentioned above were rated alike (1.6-1.8), compared to the last item, management and leadership (2.6) that was outside the mean (2.5) and rated least important of the choice items. The frequency of basic student skills appears in Table 4.15. In this category, four of the five skills were cited most by more than 80% of the respondents. Respondents reported "critical

Table 4.13 Frequency of Factors Needed for a Successful Exchange Program

Respondents (n=104)						
Factors for Conducting A Successful Exchange	Important n	%	Undecided n	%	Not Important n	%	χ^2
Institutional resources (e.g. housing, labs, faculty)	95	91.3	3	2.9	2	1.9	203.79
Clinical training site resources (e.g. lab facilities, instructors)	97	93.3	1	.96	3	2.9	322.00
Administrative support and involvement	96	92.3	3	2.9	2	1.9	235.12
Tuition fee waiver policy for exchange students	52	50.0	30	28.8	17	16.3	42.19
An International student services office	81	77.9	14	13.5	6	5.8	98.26

A frequency distribution of scores, from important to not important, for factors needed to conduct a successful transatlantic student exchange program. Ratings for factors needed for a successful exchange program are on 5-point scales with endpoints *very important* (1) and *not important* (5). All chi-square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Table 4.14 Categories/Major Themes for Factors Needed for a Successful Exchange Program and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
INSURANCE	Proper health insurance & adequate emergency coverage for international travel
STRONG LINKS	Strong personal contact between staff at partner institutions
MEMORANDUM OF UNDERSTANDING	Clearly defined document of agreement reviewed by legal departments in partner institutions
EQUIVALENCY	NAACLS approval for international experiences as equivalent to domestic

Major themes taken from respondents' statements about factors needed for a successful transatlantic exchange program. Salient points are from fully completed questionnaires only.

Table 4.15 Frequency of Basic Student Skills

Respondents (n=104)						
Basic Student Skills for Optimum Performance in an Exchange Program	Important n	%	Undecided n	%	Not Important n	%	χ^2
Technical	93	89.4	3	2.9	4	3.8	112.83
Information Technology	93	89.4	5	4.8	2	1.9	106.28
Management & leadership	56	53.8	32	30.8	12	11.5	79.46
Critical Thinking	94	90.4	3	2.9	3	2.9	160.90
Linguistic capability	88	84.6	7	6.7	5	4.8	137.85

A frequency distribution of scores, from important to not important, for basic student skills needed for a successful transatlantic student exchange program. Ratings for basic student skills are on 5-point scales with endpoints *very important* (1) and *not important* (5). All chi-square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Figure 4.12 Bar Graph Depicting Average Ratings for Essential Student Skills (n=104)

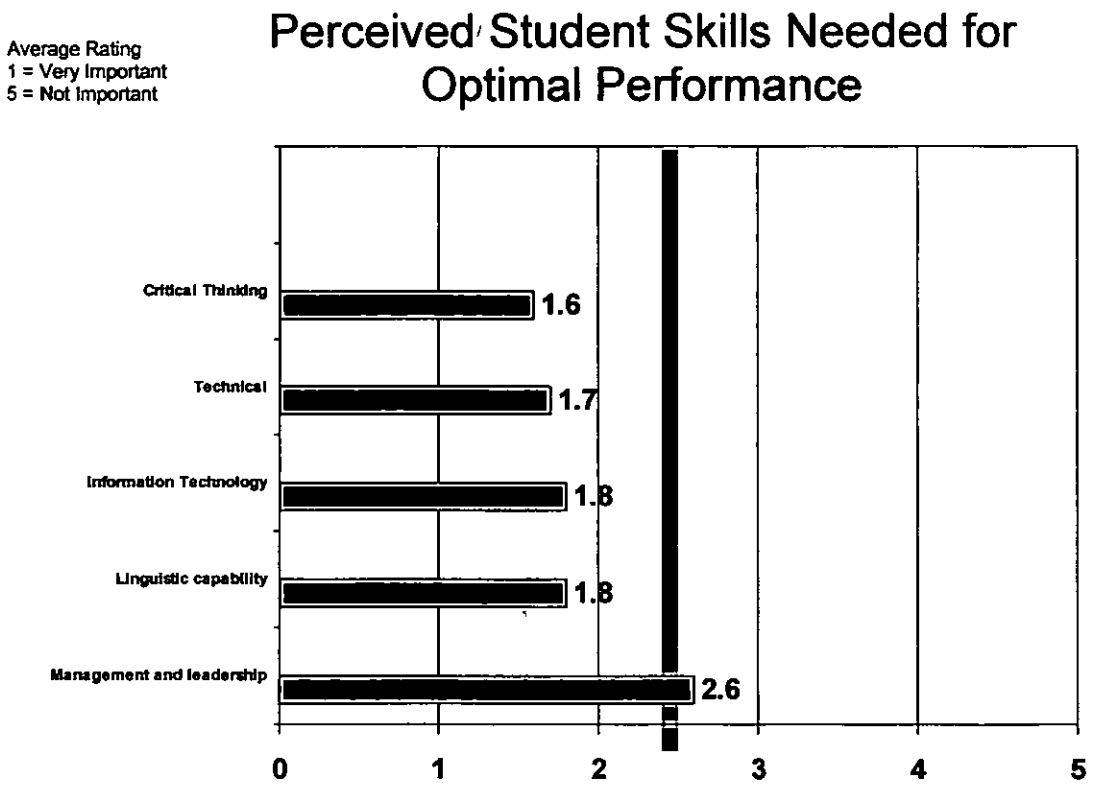


Figure 4.12 displays the average ratings for student skills that are needed for optimal performance in an international exchange program. Student skills are on 5-point scales with endpoints *very important* (1) and *not important* (5), with 2.5 as the midpoint. The vertical red line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered important. Ratings that fall above the midpoint (>2.5) are considered not important.

thinking" (90.4%, 94/104); "technical" and "information technology" skills (89.4%, 93/104) and "linguistic capability"(84.6%, 88/104) as very important/fairly important compared to approximately 50% of the respondents who cited "management and leadership" (53.8%, 56/104) as important. Respondents' statements led to the following four categories for basic skills: ability to cope, theoretical knowledge, cultural sensitivity, and native language skills (see Table 4.16 for more details).

4.17 Institutional Barriers

Subjects were asked to rate each of the potential barriers that prevented institutions from participating in a transatlantic exchange program. Ratings were on 5-point scales with endpoints *very important* (1) and *not important* (5). "Lack of institutional resources," "lack of information," and "lack of administrators' commitment" and "institutional barriers" received average ratings of 1.6, 1.8, and 1.9 respectively. Average ratings for "lack of faculty commitment" and "tuition and residency policies" were 2.0 and 2.1, respectively (Figure 4.13). "Lack of information" (81.7%, 85/104) and "lack of institutional resources" (87.5%, 91/104) were the most frequently cited institutional barriers; followed by "lack of administrators commitment" (77.9%, 81/104); "lack of faculty commitment" (75.0 %, 78/104); and "tuition and residency policies" (72.1%, 75/104) in the "important" group (see Table 4.17 for more details). Four categories/major themes developed for institutional barriers. They included insufficient expertise, workload, policy restrictions, and curriculum constraints (see Table 4.18 for details).

4.18 Student Barriers

Subjects rated each of the student barriers that they believed prevented students from participating in a Transatlantic Exchange Program. Ratings were on 5-point scales with

Table 4.16 Categories/Major Themes for Student Skills and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
ABILITY TO COPE	Students need to be adaptable, flexible, emotionally mature, & independent while away from home
THEORETICAL KNOWLEDGE	Appropriate theoretical knowledge & understanding
CULTURAL SENSITIVITY	Appreciation of diverse cultures
NATIVE LANGUAGE SKILLS	Must speak and understand language of host country

Major themes taken from respondents' statements for basic student skills needed for a successful transatlantic exchange program. Salient points are from fully completed questionnaires only.

Figure 4.13 Bar Graph Depicting Average Ratings for Perceived Institutional Barriers (n=104)

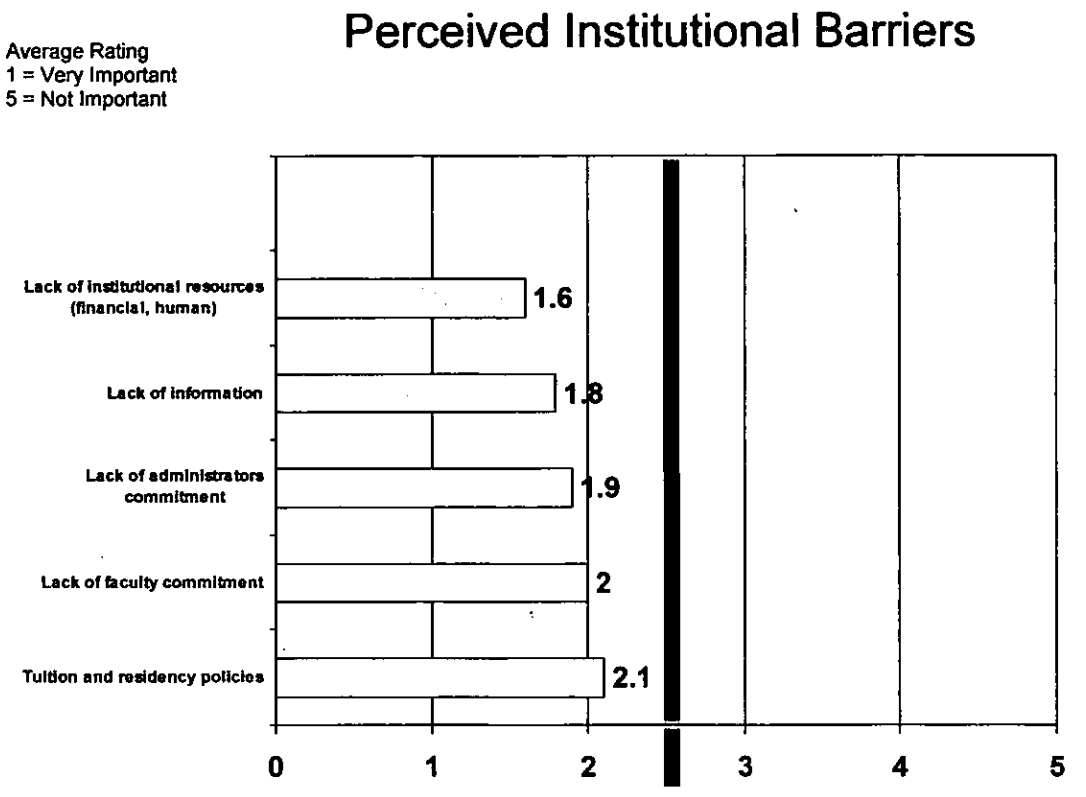


Figure 4.13 displays the average ratings for perceived barriers that prevent institutions from participating in international exchange programs. Possible institutional barriers are on 5-point scales with endpoints *very important* (1) and *not important* (5), with 2.5 as the midpoint. The red vertical line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered important. Ratings that fall above the midpoint (>2.5) are considered not important.

Table 4.17 Frequency of Institutional Barriers

Respondents (n=104)							
Potential Institutional Barriers Preventing Exchange	Important n	%	Undecided n	%	Not Important n	%	χ^2
Lack of information	85	81.7	11	10.6	4	3.8	85.71
Lack of institutional resources (e.g. financial, human)	91	87.5	6	5.8	3	2.9	191.50
Lack of faculty commitment	78	75.0	16	15.4	6	5.8	102.19
Lack of administrators commitment	81	77.9	12	11.5	7	6.7	120.42
Tuition and residency policies	75	72.1	16	15.4	7	6.7	80.73

A frequency distribution of scores, from important to not important, for potential institutional barriers that could prevent institutions from conducting a transatlantic exchange program. Institutional barriers ratings are on 5-point scales with endpoints *very important* (1) and *not important* (5). All chi-square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Table 4.18 Thematic Analysis of Institutional Barriers and Salient Points

MAJOR THEMES	SALIENT POINTS
INSUFFICIENT EXPERTISE	Lack of International Student Affairs Office to manage international matters (e.g. Immigration policies)
WORKLOAD	Academic staffs overloaded and have little spare capacity to allocate additional administrative demands
POLICY RESTRICTIONS	US registration policies have restricted locations for student placements
CURRICULUM CONSTRAINTS	Impacted curriculum provides limited opportunity for student exchanges

Major themes taken from respondents' statements about institutional barriers that could prevent institutions from conducting a transatlantic exchange program. Salient points are from fully completed questionnaires only.

endpoints *very important* (1) and *not important* (5). Figure 4.14 shows the following average ratings in rank order for potential student barriers: "lack of financial resources" (1.6); "lack of information" (1.8); "visa/immigration policies" (1.9); "language requirements" (1.9); and "credit recognition policies" (2.0). Respondents perceived all choice items as almost equally important. Lack of financial resources, lack of information, and language requirements were the most frequently cited in the student barriers category (see Table 4.19). Of the 104 respondents, 90 or 86.5 % reported lack of financial resources; 86 or 82.7% cited lack of information, and 84 or 80.8% in the very important/fairly important group; followed by 81 or 77.9% that cited visa/immigration requirements and 77 or 74% who cited credit recognition policies in the very important/fairly important group (see Table 4.19 for more details). Program restrictions safety developed as major themes for student barriers (Table 4.20).

4.19 International Professional Certification

When participants were asked whether or not they think international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists, they were told to specify their reasons for or against the notion of international professional certification. Table 4.21 categorizes respondents' choices by their country of origin and indicates that among the US programs surveyed, 76.5 % (65 of 85) of respondents were in favor of international certification and 38.8 % (33 of 85) were opposed to international certification. The United Kingdom and Australian programs were 100% in favor of international certification for laboratory professionals.

Figure 4.14 Bar Graph Depicting Average Ratings for Perceived Student Barriers (n=104)

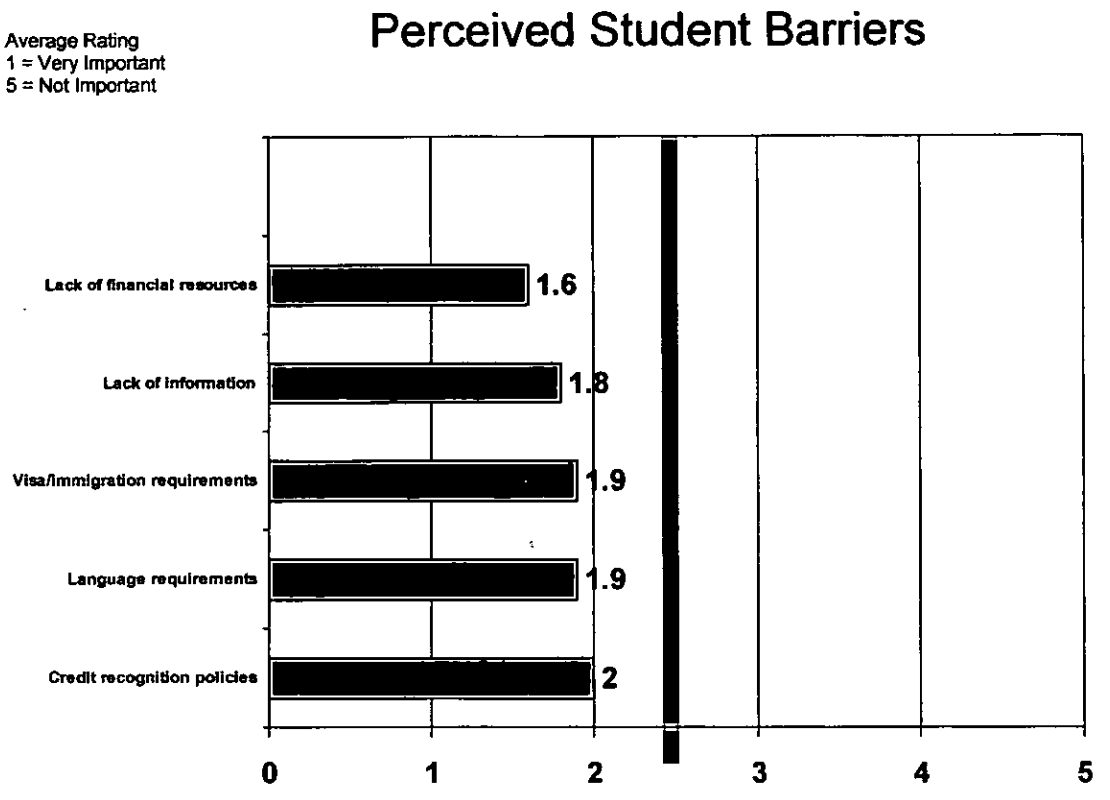


Figure 4.14 displays the average ratings for perceived barriers that prevent students from participating in international exchange programs. Student barriers are on 5-point scales with endpoints *very important* (1) and *not important* (5), with 2.5 as the midpoint. The red vertical line denotes the midpoint of 2.5. Ratings that fall below the midpoint (<2.5) are considered important. Ratings that fall above the midpoint (>2.5) are considered not important.

Table 4.19 Frequency of Student Barriers

Respondents (n=104)						
Potential Barriers Preventing Student Participation in Exchange	Important n	%	Undecided n	%	Not Important n	%	χ^2
Lack of information	86	82.7	9	86.5	5	4.8	161.85
Language requirements	84	80.8	11	10.6	5	4.8	111.08
Lack of financial resources	90	86.5	7	6.7	2	1.9	212.04
Credit recognition policies	77	74.0	17	16.3	5	4.8	98.85
Visa/immigration requirements	81	77.9	12	11.5	6	5.8	131.85

A frequency distribution of scores, from important to not important, for potential barriers that might prevent students from participating in a transatlantic exchange program.
Student barriers ratings are on 5-point scales with endpoints *very important* (1) and *not important* (5). All chi-square (χ^2) values are significant at $p<.05$ unless otherwise noted.

Table 4.20 Categories/Major Themes Student Barriers and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
PROGRAM RESTRICTIONS	"We are restricted to have exchanges within 3rd year professional practice program due to different academic years between universities in northern and southern hemispheres"
SAFETY	Homeland Security

Major themes taken from respondents' statements about institutional barriers that might prevent institutions from conducting a transatlantic exchange program. Salient points are from fully completed questionnaires only.

Table 4.21 Respondents For and Against International Professional Certification

Respondents (n=85)				
Position on international certification by country	For n	%	Against n	%
United States	52	61.2	33	38.8
UK and Australia	13	15.3	0	0.0
Total	65	76.5	33	38.8

This table provides the number and percentage of respondents who favored and opposed international professional certification.

The following categories/major themes that developed for favoring international professional certification: workforce/employment issues, international standards, mobility, globalization, and provisions. These major themes, along with direct quotations from respondents in favor of international professional certification are presented in Table 4.22. The categories/major themes that developed in opposition to international certification included: regional differences, reciprocity, standardization, and other interests (see Table 4.23 for more details).

4.20 Eligibility Requirements for International Professional Certification

Subjects were asked to choose from three possible qualifications that they thought clinical laboratory scientists/medical technologists/biomedical scientists should meet in order to be eligible for international professional certification. Once again, they could specify "other" qualifications that were not mentioned. Table 4.24 shows the eligibility qualifications and number of subjects that responded

Table 4.22 Categories/Major Themes in Favor of International Professional Certification and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
WORKFORCE/EMPLOYMENT	"need to increase job flexibility for laboratory professionals to address current & projected shortages;" international professional certification "would assist employers if they had a common method for assessing individuals as potential employees"
INTERNATIONAL STANDARDS	"international professional certification has potential to lead to common standards of education & training, improve quality of work practice, enhance the profile of lab scientists, and provide an international base for professional development and continuing education programs"
MOBILITY	"international professional certification would foster mobility; "simplify exchange of labour;" "Hospitals would not be reluctant to hire someone who had an international certification as they are now"
GLOBALIZATION	"to expand the globalization of the lab profession;" "Treaty of Rome/Bologna Declaration"
PROVISIONS	"provided the international certification and eligibility requirements are reviewed by an international peer review process and once certified, competence must be demonstrated before one can practice in another country"

Major themes taken from respondents' statements who favored international professional certification. Salient points are from fully completed questionnaires only.

Table 4.23 Categories/Major Themes in Opposition to International Professional Certification and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
REGIONAL DIFFERENCES	"each country has own special needs/priorities and certification agencies;" "too many differences in both testing methodologies and clinical laboratory practice"
RECIPROCITY	"should have cross recognition of qualifications;" "reciprocity should be granted for national certification"
STANDARDIZATION	"problem is lack of uniform standards;" "commendable idea but we're not standardized/equivalent in education, clinical experience, and culture"
OTHER INTERESTS	"helpful, but not essential." "There are many more important issues/problems to be solved before one rises to the level of requiring action."

Major themes taken from respondents' statements who were opposed to international professional certification. Salient points are from fully completed questionnaires only.

Table 4.24 Eligibility Requirements for International Professional Certification (n=104)

Respondents (n=104)						
Eligibility Requirements	Yes		No		Unsure	
	n	%	n	%	n	%
Pass respective exam plus 3 years of work experience	36	34.6	34	32.6	34	32.6
Pass respective exam plus 2 years of work experience	35	33.6	28	26.9	41	39.4
Only pass their respective National certification/state exam	23	22.1	39	37.5	42	40.3

This table includes the number and percentage of respondents' preferences on eligibility requirements for international professional certification.

yes, no, or unsure regarding eligibility requirements for international professional certification. Responses to the first choice "pass respective exam plus 3 years of work experience" were evenly split as follows: yes (34.6%, 36/104); no (32.6%, 34/104); and unsure (32.6%, 34/104). Responses to the second choice "pass respective exam plus 2 years work experience" reported a higher degree of uncertainty as follows: yes (33.6%, 35/104); no (26.9%, 28/104); and unsure (39.4%, 41/104). Respondents reported the most opposition and uncertainty with the third choice "only pass their respective national certification/state exam" as follows: yes (22.1%, 23/104); no (37.5%, 39/104); and unsure (40.3%, 42/104). These data are shown as a bar graph in Figure 4.15. No consensus was reached by the respondents regarding eligibility requirements for international professional certification. Interestingly, 13.5% (14/104) of the respondents reported "other" choices. The respondents' statements provided good insight regarding other options for consideration (see Table 4.25 for more details). Categories/major themes that developed for eligibility requirements included dual certification, mutual recognition, international examination, minimal work experience, and high standards.

4.21 Mutual Credentialing

Participants were asked whether or not they thought laboratory credentialing agencies in the United States and the United Kingdom should consider mutual credentialing for graduates of their respective accredited clinical laboratory sciences/medical technology/biomedical science programs. Table 4.26 depicts the number of programs by country that favor or oppose mutual credentialing. Of 99 respondents who answered this question, 74 % (73 of 99) were in favor of mutual credentialing, 19 % (19/99) were against mutual credentialing, and 7% (7 of 99) were not sure about mutual credentialing.

Figure 4.15 Bar Graph Depicting Responses for Professional Qualifications (n=104)

Figure 4.15 illustrates various qualifications that respondents think laboratory professionals should meet in order to be eligible for international professional certification.

Table 4.25 Categories/Major Themes for Eligibility Requirements and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
DUAL CERTIFICATION	Pass home certification exam and host country exam
MUTUAL RECOGNITION	Credentialing agencies should evaluate credentials and consider reciprocity
INTERNATIONAL EXAMINATION	Pass an international certification exam
MINIMAL WORK EXPERIENCE	Pass respective certification/registration exam and have minimum of 1 year full time work experience
HIGH STANDARDS	"A high standard would have to be met. It is not gained by simply working in a lab; education alone does not imply commitment and proficiency."

Major themes taken from respondents' preferences on eligibility requirements for international professional certification. Salient points are from fully completed questionnaires only.

Table 4.26 Respondents Positions Regarding Mutual Credentialing (n=99)

Respondents (n=99)						
Position on Mutual Credentialing by country	Yes n	%	No n	%	Maybe n	%
United States	63	63.6	18	18.1	6	6.0
UK and Australia	10	10	1	1.0	1	1.0
Total	73	73.7	19	19.1	7	7.0

This table includes the number and percentages of respondents, by country, who favored, opposed, or were not sure of their position about the United States and United Kingdom consideration on mutual credentialing for graduates of their programs.

Respondents were also asked to state how they saw mutual credentialing being accomplished and to state reasons, if any, they have against mutual credentialing. The categories/major themes that developed for accomplishing mutual credentialing included: international exam; study other models; international commission; assigned committee tasks; communication/collaboration; common standards; international conference; obstacles; and globalization. Among the many categories were the most number of statements and most substantive comments that respondents provided throughout the survey (see Table 4.27 for more details).

4.22 Level of Interest in Starting International Exchanges

Subjects were asked whether or not they were interested in starting an international exchange program at their institution and to specify their reasons for or against starting such a program. Table 4.28 shows the respondents' level of interest in starting an international exchange program at their institution, with 47.1% (49/104) of the respondents in favor of starting an exchange program; 43.2% (45/104) are not interested; and 9.6% (10/104) are unsure about starting an international exchange program at their institution. The categories/major themes that developed for starting an international exchange program included target countries; distance education; limitations/restrictions; and inadequate resources. Respondents' statements related to the aforementioned categories appear in Table 4.29.

4.23 Other Comments/Suggestions

Very few subjects (4 of 104) chose to take advantage of providing additional comments or suggestions. Categories/major themes that developed for subjects' comments and suggestions include program closures; transcript evaluation; and expand to include the Philippines (See Table 4.30 for details). This chapter focused on the quantitative and qualitative results of the survey questionnaire.

Table 4.27 Categories/Major Themes for Mutual Credentialing and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
INTERNATIONAL EXAM	"require all students to pass a standardized international exam and obtain one year residency"
STUDY OTHER MODELS	"first study how this is being done for other regulated professions such as Nursing, Engineers, Accountants, Medicine"
INTERNATIONAL COMMISSION	"a commission could establish minimum standards;" "collaboration and joint meetings between US and UK credentialing agencies to determine what standards will be mutually beneficial;" "create an international consortium to evaluate and develop criteria"
ASSIGNED COMMITTEE TASKS	"testing curricula and curricula outcomes for equivalency;" agencies need to agree on entry-level competencies which will be met and how this is done;" "UK and US agencies develop eligibility qualifications for their exams that recognize international graduates;" "compare expectations and job responsibilities for entry-level personnel"
COMMUNICATION/ COLLABORATION	communication, dialogue about graduation requirements, accreditation and certification equivalencies; collaboration between professional bodies
COMMON STANDARDS	"establish mutually agreeable standards for content of programs & assessment of programs and graduates, select institutions that will participate;" "comparison of current procedures/policies for acquisition of credentials and work towards a common policy;" "there would have to be joint acceptance of standards/practices by each country, a uniform exam"
INTERNATIONAL CONFERENCE	"have all agencies send representatives to a conference to determine outline;" "consensus international meeting between US and UK credentialing agencies"
OBSTACLES	"it would be difficult because US has multiple accrediting agencies;" "certification is not recognized by employers;" "differences in units of measure used in the lab;" "government restrictions would be too cumbersome and daunting;" not possible to implement due to state licensure restrictions
GLOBALIZATION	"this should be extended out to all European countries and Australia;" "Canada should also be included in the mix"

Major themes taken from respondents' statements about United States and United Kingdom mutual credentialing for graduates of their programs. Salient points are from fully completed questionnaires only.

Table 4.28 Respondents Positions on Starting an International Exchange Program

Respondents (n=104)

Positions on starting an international exchange program by country	For		Against		Unsure	
	n	%	n	%	n	%
United States	38	36.5	43	41.3	10	9.6
UK and Australia	11	10.5	2	1.9	0	0.0
Total	49	47.1	45	43.2	10	9.6

This table includes the number and percentage of respondents that were interested in starting an international exchange program.

Table 4.29 Categories/Major Themes for Starting an International Exchange Program and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
TARGET COUNTRIES	Canada, China, Europe, Greenland, Riga, Latvia, Mexico, New Zealand, Philippines, Puerto Rico, Taiwan, UK, US; open to new sites; anyplace that is interested; "I see no reason to limit the country; however, English competency would be needed"
DISTANCE EDUCATION	"we are at a beginning stage, but it may be done via online education"
LIMITATIONS/RESTRICTIONS	"with the understanding that international students have to demonstrate competencies;" "I'd be interested in partnering with programs which could have a College of American Pathologist (CAP)-approved laboratory experience for our students;" "we've had Erasmus exchange with London, but it did not work out so well, the communication became difficult due to many changes in contact persons;" "if we were provided funds and the program was not too expensive;" UK credentials are not accepted by the ASCP BOR
INADEQUATE RESOURCES	"lack time, faculty, staff, and funding to manage an international exchange program;" "lack of adequate housing and transportation;" "Human Resources issues"; "do not possess the resources to start such a program at this time, but the concept is fascinating and I'm hopeful that the profession will see the development of these programs in the future"

Major themes taken from respondents' statements who said they were interested in starting an international exchange program. Salient points are from fully completed questionnaires only.

Table 4.30 Categories/Major Themes for Other Comments, Suggestions, and Salient Points

CATEGORIES/MAJOR THEMES	SALIENT POINTS
PROGRAM CLOSURES	"In 1970 there were 791 schools of medical technology. As of October 2003 there are only 234 MT schools"
TRANSCRIPT EVALUATION	"we need accrediting/licensing agencies to have a common list of agencies for the evaluation of international transcripts"
THE PHILIPPINES	"The Philippines seems to be left out, which is a mistake;" "there are surpluses of Pilipino MT graduates who are willing to travel and participate in exchange programs"

Major themes taken from respondents' statements who provided other comments and suggestions. Salient points are from fully completed questionnaires only.

Data were collected and analyzed using standard methodologies recommended by my Thesis Committee, Department of Forensic and Investigative Science, the University of Central Lancashire, and other experts in the fields of quantitative and qualitative research, such as Frankfort-Nachmias and Nachmias (2000), Guba and Lincoln (1998), Hammersley (1992) and Leedy (1993). The survey results in this chapter were presented in various formats including frequency distribution tables, charts, lists, figures, bar graphs, and brief narrations. Information contained in the next chapter presents an evaluation of the survey questionnaire results.

Chapter 5

EVALUATION OF SURVEY RESULTS

5.1 Description of the sample

Of the 234 baccalaureate programs surveyed, 91 responses came from the United States and 13 responses came from the United Kingdom and Australia. The majority of the sampled population was a) female (73.1%); b) held advanced degrees (87.5%); c) worked at a university or academic health center (67.3%); and d) held the title of program director (75%) (Section 4.4). This pattern was similar in percentage of females, certifications held, and the work settings that Hofherr and colleagues reported in a recent United States census survey and profile of clinical laboratory scientists (Hofherr, Francis, Peddecord, and Krolak 2002). The sampling results in this study crossed international boundaries, except for gender wherein all United Kingdom and Australian program heads were male, not female. In the United States, laboratory medicine has been a female-dominated profession since its inception.

5.2 Response Rates

Despite concerted efforts to seek an equal distributional response from the United States and the international community, this proved to be an unfortunate shortcoming of the study. Only 28.2% (13 of 46) of non-United States programs responded from the international community, compared to 38.9% (91 of 234) from across the United States. Overseas representation included: 100% (1 of 1) from Australia and 32.4% (12 of 37) from the United Kingdom. No responses were received from the other IBMS-BSc accredited programs surveyed including: Malta (n=1); Malaysia (n=3); Hong Kong (n=1); Sri Lanka (n=1); and Ireland (n=2). Research reports have indicated that one of the biggest concerns in Internet surveying is bias due to the sampled population choosing not

to access the Internet (Kay and Johnson, 1999; Crawford, Cooper and Lamias, 2001; Couper, Traugott, and Lamias, 2001).

It is difficult to speculate exactly why these countries did not respond, but I believe that a combination of factors including heavy workloads, email burden, and differences in computer technologies could have prevented this cohort from responding to my survey. For example, I receive ~500 e-mails each week, and so do others. Burdens increase with high levels of responsibility, so other research directors may also be burdened in this way.

Other researchers who compared and contrasted response rates of postal mail and e-mail surveys reported that the largest limiting factor of electronic surveys pertains to sampling in that the sampled population must have access to, and familiarity with, the required technology (Shannon and Bradshaw, 2002). In other words, just because one has an access to the Internet does not mean they choose to use it or if they do that they are comfortable using email. As Solomon put it "studies are just beginning to learn the optimal ways to structure and format Internet surveys to limit biases and increase response rates" (Solomon, 2001). Despite the aforementioned factors that may have had a negative impact on survey completion, the overall response rate (37.1%) was within the mean response rate (36.83%) of email surveys reported by Sheehan (2001). According to some researchers, email surveys have been used for approximately fifteen years, but a recent report suggests that response rates to email surveys have decreased significantly since 1986 as use of email has increased (Sheehan, 2001).

5.3 Responses by Region and Country

American-based respondents (n=91) represented all regions from across the United States, the majority of which came from programs located in the north-eastern states (47.2%, 26/55) and the mid-western states (40.3%, 31/77); followed by programs in the southern states (33.7%, 29/86) (Table 4.3). Of the programs located outside the United States, the majority of the respondents (31.6%, 12/38) were from across England (Table 4.4).

5.4 Factors Influencing Response Rate

A combination of other factors could have influenced my survey response rate such as the issue of salience, design issues, information technology access issues, monetary incentives or other rewards for survey participation, and the length of the survey. Martin (1994) defines salience as "the association of importance and/or timeliness with a specific topic." On a positive note, I believe that salience was an issue for the sampled population, evidenced by the pattern of responses received during the one-year survey period. Specifically, the response to the initial mailing was very slow (n=4); however, there was a significant increase in responses following the 2nd reminder. Unlike a typical survey pattern, where the original response is very high and then it begins to taper off, the original survey response was low and increased dramatically after the 3rd and 4th reminders (Figure 4.2). Interestingly, despite the current laboratory workforce environment with its attendant laboratory personnel shortages, busy schedules, and increased workloads, almost 40% (104/280) of the sampled population may have thought

that the topics of "transnational education" and "international professional certification" were important enough to take the time to not only answer the survey questions, but to also offer very substantive comments. Moreover, since only 10.5% (11/104) of the respondents said that they were engaged in international exchange programs, it seems to me that the respondents believed the topics to be important enough to express their thoughts and opinions about them, one way or the other. Indeed, this was the case (Tables 4.22 and 4.23) as evidenced by responses to the question "do you think international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists?" On the other hand, timing and technology may have been negatively influenced by the increased demands and challenges confronting the sampled population and the actual workplace environment.

5.5 Survey Instrumentation

The survey instrument also appeared to be a contributing factor to the response rate due to Internet technology issues such as electronic delivery and formatting. The total number of undeliverable e-mails during the survey period was 28. Messages such as "unable to deliver, user not known" were re-sent after verifying the email addresses from the original and subsequent mailing list throughout the survey period. In most cases, the names and corresponding email addresses of the original sampled population had changed or directors/liaison officers had changed their Internet Service Provider (ISP) and or email addresses. Bradley (1999) describes the issue of changing ISP and email addresses as 'churn' and suggests that 'churn' has consequences such as under-representation. To minimize the 'churn' effect, I reviewed all of the non-respondents e-

mail addresses posted on the NAACLS and IBMS websites, the source of the mailing list, and prior to sending each reminder.

In terms of the electronic formatting issue, the original survey that I designed was four pages; however, when I converted it to an electronic version, it turned out to be three times the length of the original. For this reason, the survey was re-formatted midway through the survey period. Even though some type of compensation could have been offered to those who completed the survey, no financial compensation or incentive, other than providing a report of the survey results, was feasible due to financial constraints.

5.6 Program Enrollment

Of the 104 programs represented by the sampled population, the combined undergraduate CLS/MT/BMS student enrollment was 2604, of which 1754 students were enrolled in United States programs (n=91) and 850 were enrolled in United Kingdom/Australian programs (n=38) (Figure 4.5). The mean number for American CLS/MT program enrollment was 21.4, whereas the mean number for United Kingdom/Australian BMS programs was significantly higher (77.3). Of the CLS/MT/BMS programs (n=104), enrollment in 19 programs ranged from 1 to 5 students; 23 programs had 6 to 10 students; 13 programs enrolled from 11 to 15 students; only 2 programs had from 16 to 20 students. The majority of programs (n=47) have an average program enrollment of over 20 students (Figure 4.7).

It should be noted that student enrollment was limited to IBMS and NAACLS-accredited or approved baccalaureate programs. Masters and doctoral degree CLS/MT/BMS programs were excluded from this study.

5.7 Transatlantic Exchange Program

Subjects were asked to rank their preferences for the following categories of a potential transatlantic exchange program: *program components* (Table 4.9); *student assessment and selection criteria* (Table 4.11); *factors for a successful exchange* (Table 4.13); *student skills for optimum performance in such an exchange* Table 4.15), *institutional barriers* (Table 4.17); *and student barriers* (Table 4.19) preventing participation in such an exchange. The use of the Likert scale (1-5) methodology had the desired effect of providing respondents the opportunity to select "very important" on their preferred choices and to select "not important" on items they believed were not of interest to them, or of much less importance. Respondents were also provided with the opportunity to specify alternate preferences of their own choosing when a particular item was not among the item choices. The Chi-square (χ^2) goodness-of-fit tests were conducted to determine whether or not sample proportions matched the theoretical values. Frankfort-Nachmias and Nachmias (2000), Miles and Huberman (1994) and others were consulted for this statistical analysis.

Based on the results, the top two preferences for *program components* were bench training in multiple laboratory rotations (χ^2 (5) = 186.42, $p<0.0005$) and a laboratory course in one subject (χ^2 (5)=55.35, $p<0.0005$), accounting for 82.7% and 62.5% of the responses, respectively. Results obtained from this category were highly significant at the 1% significance level and there appeared to be a very strong association between the ratings (response categories 1-5) and the various characteristics (A-E) that were being tested for (Table 4.9). Respondents stated other preferences including that they believed a

transatlantic exchange program should provide such as research opportunities, ethics, information technology, problem solving and decision making (Table 4.10). They also preferred continuity of course work and a multidisciplinary approach to teaching and learning.

An excellent academic record (χ^2 (4)=123.17, p<.05) and effective communication skills (χ^2 (5)=196.00, p<.05) were the most frequently cited *student assessment and selection criteria.* Ninety percent of the respondents cited academic record and 93.3% of the respondents cited effective communication skills compared to only 14.4% of the respondents that cited prior overseas experience (Table 4.11). Interestingly, other stated preferences included: adult attributes such as maturity and independence; immigration clearance such as a current visa; and problem solving skills were also mentioned (Table 4.12 details). Results obtained from this category were also highly significant at the 1% significance level.

The top three preferences for *factors for a successful exchange* included: institutional resources (χ^2 (4) 203.79, p <0.0005), clinical training site resources (χ^2 (5) 322.00, p<0.0005) and administrative support and involvement (χ^2(5) 235.12, p<0.0005)(accounting for over 90% of the responses). Only 50% of the respondents (52/104) cited tuition fee waiver policy (Table 4.13). Results obtained from this category were highly significant (p<0.0005) and there appeared to be a very strong association between the ratings (response categories 1-5) and the various characteristics (A-E) that were being tested for. Additional preferences cited by respondents were very revealing as to additional matters of importance for conducting a successful international exchange

program. Other key issues included: strong links between partner institutions; insurance coverage; memoranda of understanding; and approval by the US accrediting body for the international student experiences (Table 4.14).

Information technology (χ^2 (4) 106.28, $p<0.0005$), technical skills (χ^2(4) 112.83, $p<0.005$), and critical thinking skills (χ^2 (4) 160.90, $p<0.005$) accounted for ~90% of the respondents' preferences for *student skills needed for optimum performance in an exchange*. Again, these results were highly significant ($p<0.0005$). Once again there appeared to be a very strong association between the ratings (response categories) and the various characteristics (A-E) that were tested for (Table 4.15). As seen in Table 4.16, other preferences were cited by respondents such as appreciation for cultural diversity; coping mechanisms; and theoretical knowledge.

The top two perceived reasons for *institutional barriers* were lack of information (χ^2 (4) 85.71, $p<0.0005$) and lack of institutional resources (χ^2(5)191.50, $p<0.005$) (accounting for over 80% of the respondents' preferences). As seen in all previous categories, the results were highly significant ($p<0.005$). Table 4.17 presents more details. Other important matters reported by the respondents included: lack of an international student affairs office; increased faculty/staff workload; an impacted curriculum; and government policy restrictions (Table 4.18).

In the category of *student barriers*, lack of financial resources (χ^2 (5) 212.04, $p<0.0005$), and lack of information (χ^2 (5) 161.85, $p<0.0005$), also seen as an institutional barrier, and language requirements (χ^2 (5) 111.08, $p<0.0005$) accounted for more than 80% of the respondents preferences. These results were also very significant

($p<0.0005$) indicating that there appeared to be a very strong association between the ratings (response categories) and the various characteristics (A-E) that were tested for (see Table 21 for more details). Of concern to a number of respondents was the notion that homeland security could prevent students from participating in an international student exchange.

These results illustrated a strong level of homogeneity within the sample population in terms of the various characteristics that I was testing for. These results provided relevant data and reached an expert consensus regarding key factors that one must consider in the planning and implementation of a transatlantic exchange program.

5.8 The Research Questions

This study proposed the following four research questions (RQ):

RQ1: How many clinical/biomedical sciences students participate in current international exchanges?

The following question was included to address this issue:

Does your program have an international exchange program? If you answered yes to this question, please provide the following information about your international exchange program/s:

a. Name of host institution/s
b. Name of host country/countries
c. Overall number of students exchanged

d. Overall number of faculty exchanges

e. Average length of exchange period (in months)

The results indicated that the total number of students that were participating in international exchanges was 186. The majority of international exchange students (63.4%,118/186) were associated with the United Kingdom/Australia programs (n=6), while 36.5% (68/186) of the exchange students were affiliated with the American programs (n=5). Almost half of the United Kingdom/Australian programs (46.2%,6/13) were engaged in international exchanges of students and staff compared to only 5.5% of United States programs (5/91) that primarily exchange students and rarely cited faculty/staff participation in their exchange programs (Table 4.5). Clearly, the Erasmus program appears to be an advantage for European students wishing to participate in international exchange programs and may explain the nearly 50% student exchange rate among United Kingdom and Australian programs.

The total student enrollment among the eleven programs that participated in international exchanges was 493. That being said, only 7.1% (186/2604) of the total student population participated in international exchanges. Whereas 37.7% (186/493) of the students that were enrolled in programs that engaged in international exchanges participated in international exchanges. Table 4.6 details the international exchanges by the home and host countries, numbers of student and faculty participants, and the average length of the exchange period. Of the total number of international exchange programs (n=11), the majority of programs (63.6%,7/11) reported that they exchanged from 1 to 15 students and faculty/staff (Figure 4.7).

RQ2: What is the level of interest and commitment among laboratory program directors in international certification for biomedical scientists (BMS) and clinical laboratory scientists/medical technologists (CLS/MT)?

This question sought expert opinion regarding the notion of international professional certification for laboratory professionals. The following question was included to address this issue:

Do you think international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists?

a. Yes: If yes, Why? Be specific

b. If no, why not? Be specific

More than three-quarters (76.5%) of the respondents (65/85) said that they were in favor of international certification for the BMS/CLS/MT profession (Table 4.21). The binomial test was conducted for statistical significance of the findings. The binomial test for the question "do you think international certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists" produced a highly significant result ($p<0.005$) and showed that it is believed that international professional certification is important. Although 81.7% of the respondents (85/104) answered this question, these results are unequivocal and they appear to illustrate a strong interest in, and commitment to, the notion of international professional certification as evidenced by respondents' statements. Respondents' statements included, but were not limited to, the following: "need to increase job flexibility for laboratory professionals to address current and projected shortages;" "international professional certification would foster mobility;"

"simplify exchange of labour;" "lead to common standards of education and training, improve quality of work practice, and enhance the profile of lab scientists...;" "hospitals would not be reluctant to hire someone who had an international certification as they are now" (Table 4.22). Of interest is that all United Kingdom and Australian respondents were in favor of international certification. The 38% who said they were opposed to international certification were from across the United States. The American respondents cited the following major issues for their opposition to international certification: regional differences, a preference for reciprocity, the absence of uniform standards, and one individual stated that there were more pressing issues or problems confronting them than this one (Table 4.23).

RQ3: Should American and British laboratory credentialing agencies consider mutual credentialing for graduates of accredited clinical/biomedical science programs and how much support exists?

The following question was included to address this issue:

Do you think that the laboratory credentialing agencies in the United States and the United Kingdom should consider mutual credentialing for graduates of their respective accredited clinical laboratory sciences/medical technology/biomedical science programs?

a. Yes: If yes, how do you see this being accomplished?

b. No: If no, please state your reasons against.

Again, a binomial test was conducted for statistical significance of the findings. The binomial test results were highly significant ($p<0.0005$) and showed that it is believed

that credentialing agencies in the United States and United Kingdom should consider mutual credentialing for graduates of their respective accredited laboratory programs. In terms of percentage, the results showed overwhelming support (73.7%) for American and British credentialing agencies to consider mutual credentialing for graduates of accredited laboratory science programs. With one exception, it was the American respondents (18/99) who were against mutual credentialing. Interestingly, 6% (6/99) of the United States respondents and 1% (1/99) of the United Kingdom/Australian respondents cited "maybe," rather than "yes" or "no" (Table 4.26). Since "maybe" is not definitive, I disregarded the 7 respondents who couldn't make up their mind.

Of equal, and perhaps greater, importance is the valuable information gleaned from the respondents' statements as to how mutual credentialing might be accomplished. Statements such as "collaboration and joint meetings between United States and United Kingdom credentialing agencies to determine what standards will be mutually beneficial;" "create an international consortium to evaluate and develop criteria;" "agencies need to agree on entry-level competencies which will be met and how this is done;" "collaboration between professional bodies;" "have all agencies send representatives to a conference to determine the outline" suggest that strong support exists among the sampled population for the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) and the Institute of Biomedical Science (IBMS) to consider their recommendations for possibly accomplishing mutual credentialing in the future (Table 4.27).

RQ4: What would be the recommended pattern or model by which biomedical scientists in the UK and clinical laboratory scientists in the US should be trained in order to be prepared for possible international professional certification?

The following question was included to address this matter:

What qualifications do you think clinical laboratory scientists/medical technologists/biomedical scientists should meet in order to be eligible for international professional certification? Y=Yes, N=No

a) Pass respective certification/registration exam plus 3 years work experience Y N

b) Pass respective certification/registration exam plus 2 years work experience Y N

c) Only pass their respective national certification/state registration exam Y N

d) Other. Please specify

Based on the opinions and thoughts cited in this study regarding the recommended pattern or model by which BMS in the United Kingdom and CLS in the Unites States should be prepared for international professional certification, no consensus was reached on this issue. Approximately one third of the respondents' (34.6%,36/104) thought that individuals should be certified/registered in their home country and have a minimum of three years of work experience; approximately one third of the respondents (33.6%,35/104) thought that individuals should be certified/registered in their home country and have two years of work experience; while almost a quarter of the respondents (22.1%,23/104) thought that being certified/registered in their own country was enough to be prepared for international professional certification (Table 4.24). The other

respondents suggested alternative options such as: pass both their home certification exam and the host country's exam; pass an international certification exam; be certified/registered and have a minimum of one year full time work experience (Table 4.25).

5.9 Summary

This chapter described the data evaluation process used to analyze the information derived from a set of seventeen questions posed to laboratory program directors/liaison officers in order to address the study's four research questions. Clearly, the combined quantitative and qualitative methodological approach to this study provided valuable information and insight to the respondents' thoughts and opinions about each of the research questions.

The data collected yielded statistically significant findings and valuable substantive comments. Most importantly, the overall information gathered from this study informed the research questions and yielded an expert consensus. Interestingly, despite education programmatic and laboratory training differences that exit between United States clinical laboratory sciences/medical technology and United Kingdom/Australian biomedical sciences there was more agreement than disagreement between the American, British and Australian respondents on most of the issues presented. The next chapter presents the summary of findings, conclusions, and recommendations of this study.

Chapter 6

CONCLUSIONS

"Global competency exists when a learner is able to understand the interconnectedness of peoples and systems, to have a general knowledge of history and world events, to accept and cope with the existence of different cultural values and attitudes and, indeed, to celebrate the richness and benefits of this diversity."

American Council on International Intercultural Education (1996)

6.1 Introduction

This chapter presents a final discussion of the survey findings generated from each of the research questions, additional information gathered during the course of this research, recommendations, and conclusions based upon careful analyses of the quantitative and qualitative data derived from this project.

6.1.1 Research Question One

How many clinical/biomedical sciences students participate in current international exchanges of the programs surveyed?

Only 10.5 percent (11/104) of the programs surveyed were actively engaged in international student exchanges, in which a total of 186 students participated in student exchanges (Table 4.6). The total student enrollment within the 11 participating student exchange programs was 493, yielding a student exchange rate of 37.7%. However, if one looks at the total student enrollment within the 104 programs, then the percentage of students engaged in international exchanges drops to 7.1% (186/2604). Of equal importance was the low level of faculty/staff involvement reported. Respondents indicated that only 17 faculty/staff participated in the international exchange programs.

Based on the survey results of low levels of laboratory sciences program involvement in international faculty/student exchanges, these programs would benefit from increased opportunities for international exchanges. This would facilitate the development of global competency among those engaged in laboratory sciences education so that they can function more effectively in a global society. Numerous explanations of "global competence" have appeared in the literature. Some authors have suggested that "global competence" or "international competence" recognizes the need to know more about the world (Wilson, 2000). Others have emphasized "intercultural competence," focusing on how individuals engage in cross-cultural encounters, suggesting that knowledge alone does not suffice (Fantini, Arias-Galicia, and Guay, 2001). A combination of both notions appears in a report from a 1996 conference convened by the American Council on International Intercultural Education (ACIIE), at which a group of educators, governmental and nongovernmental representatives from industry gathered for a conference entitled "*Educating For the Global Community: A Framework for Community Colleges.*" This group worked toward establishing a concise profile of the educated person in a global society and identified the following four developmental stages in the process of achieving global competence: 1) recognition of global systems and their connectedness, including personal awareness and openness to other cultures, attitudes and values at home and abroad; 2) intercultural skills and direct interpersonal experiences; 3) general knowledge of history and world events including geography, politics, and economics; and 4) detailed area studies specializing involving expertise in another language, culture, and country (The American Council on International Intercultural Education, 1996). I believe strongly that the laboratory

community needs to develop a global and intercultural competent citizenry in order to function effectively in the global society of this new millennium.

6.1.2 Research Question Two

What is the level of interest and commitment among laboratory program directors surveyed regarding international certification for biomedical scientists and clinical laboratory scientists/medical technologists?

This question was deemed to be a key aspect of this study as at the time of this writing and to the best of my knowledge, there has been no reference to international certification for laboratory personnel, at national or international laboratory professional conferences, and no information on this topic has been posted on the websites of laboratory credentialing agencies or laboratory professional societies. Given this, the overwhelming significance of the responses to this question is intriguing. The majority of respondents (65/85; 76.5%) favored the notion of international certification for qualified laboratory professionals (Table 4.21). This high level of interest was measured statistically by the binomial test. The test results ($p<0.005$) indicate an extremely high level of certainty that the respondents believe international certification is important. In addition, the large number and content of the respondents' statements reflect a high level of commitment for international professional certification as evidenced by salient points such as: improving the laboratory workforce shortage problem; potential to lead to common standards; improving quality of work practices; enhancing the profile of laboratory professionals;

fostering mobility; and expanding globalization of the laboratory profession, among others (Table 4.22).

These findings show a strong level of interest among the respondents in globalization of the certification/registration processes. Although certification of clinical laboratory scientists/medical technologists and registration of biomedical scientists is not mandated, the certification/registration processes do provide public protection, such as assisting employers and consumers in recognizing qualified laboratory professionals. According to Goldsmith and colleagues, several models are already in place to assist in globalizing certification systems including: creating uniform international certification standards; licensing agreements; reciprocity/ mutual recognition agreements; and exporting certification between countries (Goldsmith, Swift, and Briggman, 2003).

The outcomes of this research had a positive affect on the American Society for Clinical Pathology Board of Registry (ASCP-BOR), which endorsed this study. In 2002, the ASCP-BOR took the first step toward exploring globalization of their certification process by establishing a Globalization Task Force, to which I was appointed by the ASCP Board of Registry Board of Governors. Since then, the *Task Force* has been engaged in research on globalization issues related to the laboratory profession (ASCP-BOR Globalization Task Force, 2004).

6.1.3 Research Question Three

Should American and British laboratory credentialing agencies consider mutual credentialing for graduates of accredited clinical/biomedical science programs and how much support currently exists?

The results to this question were unequivocally affirmative regarding the notion of mutual credentialing for laboratory personnel, evidenced by the 73.7 percent of respondents who answered yes (Table 4.26). I presented these results to the ASCP Board of Registry (ASCP-BOR) and the Institute of Biomedical Science (IBMS) in the United Kingdom, both of which endorsed this study, for their consideration. The final survey findings were of particular interest to *Task Force* members, especially since they were familiar with the preliminary survey findings that were presented on my poster at the 2003 IBMS Congress in Birmingham, the United Kingdom that convened 29 September to 1 October 2003. The poster entitled "Transatlantic Cooperation in Biomedical Science Education" earned the top award in the education category.

These findings may have served as a catalyst for the *Task Force*, which includes representatives from IBMS and Australian Institute of Medical Science (AIMS), to propose a trilateral pilot project to explore opportunities for working together regarding mutual credentialing of laboratory personnel for the three countries (United States, United Kingdom, and Australia) willing to engage in this pilot project.

6.1.4 Research Question Four

What would be the recommended pattern or model by which biomedical scientists in the United Kingdom and clinical laboratory scientists in the United States should be trained in order to be prepared for possible international professional certification?

No consensus was reached in terms of eligibility requirements for international certification (Figure 4.15 and Table 4.24). Despite the lack of consensus, respondents made excellent suggestions in terms of other preferences for international professional certification eligibility that were not listed as choice items on this survey (Table 4.25). Upon careful examination of the respondent statements, there was consensus regarding the passing of one's home-based certification/registration exam as the main criterion. Others recommended the passing of the home and host countries' certification/registration examination. Another cohort suggested a separate international certification/registration examination. However, there was no consensus in terms of the combined certification/registration plus any kind of work experience. I believe that respondents' statements such as: credentialing agencies should consider reciprocity, individuals should pass an international certification examination, and individuals should pass certification exams in both the home and host country would be extremely helpful to IBMS and ASCP Board of Registry in helping them to contemplate the future direction in their certification and registration processes.

As seen in Table 4.27, respondents' statements such as "create an international consortium to evaluate and develop criteria," "United Kingdom and United States agencies should develop eligibility qualifications for their exams that recognize international graduates," and "collaboration and joint meetings between the United States and United Kingdom credentialing agencies to determine what standards will be mutually beneficial," and "consensus international meetings between United States and United Kingdom credentialing agencies" are further indications of the respondents' strong interest in IBMS and the American Society for Clinical Pathology Board of Registry (ASCP-BOR) collaborating on the issue of eligibility requirements for international certification. In light of these comments, I would recommend that IBMS and the ASCP-BOR could work together to assess the notion of international harmonization of eligibility routes for credentialing laboratory personnel.

I strongly recommend that IBMS and the Board of Registry consider a leadership initiative by organizing a global forum for key stakeholders of the laboratory profession to address regulatory issues, credentialing systems, reciprocity issues, and standards for medical laboratory personnel that operate in different countries around the globe.

6. 2 Additional Information

Throughout the course of this research, I contacted over 130 colleagues including educators, administrators, and practitioners to gain a more global perspective on the issues germane to my study such as labor shortages, mobility of health professionals, international professional standards, mutual recognition agreements, and the like. These individuals were selected on the basis of their leadership positions, professional

experience and expertise. They represented healthcare-related services including pharmacy, managed care, nursing, clinical practice, biotechnology, higher education, pathology, healthcare services administration, accreditation, certification, and public health in 20 countries around the globe. My contact persons work in a variety of venues such as public and private laboratories, governmental agencies and non-governmental healthcare organizations in Australia, Belgium, Canada, China, Egypt, Finland, France, Great Britain, Hong Kong, Iceland, Indonesia, Ireland, Kuwait, Mexico, Norway, the Netherlands, the Philippines, Spain, Sweden, and the United States including Puerto Rico, a US territory. I took copious notes during my discussions and present a few exemplary comments from these below for the record. The lessons learned from the sampled population and these members of the international community provided "added value" to this research in that my decision to use a descriptive survey method along with standard quantitative methodologies to inform the research questions provided me with much greater insight on what I was trying to learn than would have been obtained from only the quantitative data and library research. I welcomed the opportunity to give this select population an opportunity to express their personal views on the questions I raised in this project.

A message that I heard repeatedly from this group of professionals was that:

internationalization of the laboratory profession is important and long overdue!

In terms of international professional certification, a number of individuals expressed frustration about not being able to fill funded vacancies with qualified foreign educated professionals. The following comment exemplifies common experiences:

"having worked and employed people on 3 continents in a variety of government institutions, it is very frustrating NOT to have the ability to employ someone fairly quickly because they simply do not fulfill the local requirements. This may seem a fundamental essential requirement to ensure that certain standards are met. However, I have found the 'red tape' to be very cumbersome and generate too much censorship on various candidates who I believe meet those 'requirements' but cannot get registration in a country easily."

I thought the following comment was quite profound regarding the question of starting an international exchange program for biomedical/clinical laboratory science students:

"I'd like to see an international exchange program more focused along the lines you are researching and pursuing as it has potential to either be a complete failure but maybe also a world first in setting international benchmarks in laboratory science education and training fields and ultimately have significant impact on patient care on a global scale."

I much prefer to think that my proposed international student exchange model would have the potential to set international benchmarks in the field of laboratory sciences and significantly impact quality patient care, globally, rather than the thought of it turning out to be a "complete failure!"

Examples of comments that reflect overall themes that emerged from this survey and that corroborated the research findings and respondents' statements are presented below:

"this research will be valuable for all health professions and not just clinical./biomedical science programs and I'd like to send your survey to our council members."

"this research should be extended out to all European Countries and Australia."

"internationalization of medical science curricula is vital in this modern age."

"need to set up a working party to assess feasibility of mutual recognition and begin to set minimum criteria followed by development of an international set of guidelines."

"possible agreements between countries would require wide consultation with professional bodies, unions, governments, universities and professions."

6.3 Healthcare and Laboratory Services in the United Kingdom and the United States

At the start of this new Millennium, healthcare and clinical laboratory/biomedical science are faced with major challenges regarding services, education, and practice at local, regional, national, and international levels. The remaining discussion in this chapter will present some additional findings of this research investigation, conclusions and recommendations, set in the context of recent trends in the healthcare environments and laboratory workplaces in the United Kingdom and the United States.

6.3.1 Healthcare Trends in the United Kingdom

The National Health Service (NHS) Plan for Reform Programme (www.nhs.uk/nhsplan; accessed February 23, 2004), the British government's initiative to modernize the NHS, the "Making the Change" (www.doh.gov.uk/makingthechange; National Health Service, 2001) initiative that is bringing about changes in the NHS healthcare workforce and the ways in which health science professional staff are employed, financially compensated, and promoted, the "Agenda for Change," the British government's plan to modernize the NHS pay system, and the formation of the Health Professions Council (HPC) launched on 1 April 2002 (www.hpc-uk.org) are driving

forces through which the aforementioned "Change" mechanisms will bring about improvements in the quality of NHS healthcare services and set new standards for the healthcare science professions.

6.3.2 Healthcare Trends in the United States

Recent trends in the American healthcare environment such as managed care, escalating healthcare costs, pressure to globalize, threats of bioterrorism, advances in medical and information technologies, controversial bioethical issues, emerging infectious diseases, and mobility of healthcare professionals have changed the landscape of laboratory sciences education and medical laboratory practices in the United States (Flower, 1996; Coile, 2002; Fried and Gaydos, 2002; Nicholas, 2002; Harmening, 2003; Levine, 2004; Dunn, 2002; Longest, Rakich, and Darr, 2000).

6.4 Current Trends Affecting Laboratory Professionals in the United Kingdom and the United States

At present, a number of trends are affecting significantly the work of laboratory professionals in the United States. Firstly, hospital mergers, closures, and a program of consolidation are changing the landscape for American hospital-based laboratory services . Many hospitals outsource laboratory services to off-set costs associated with laboratory tests. Whereas healthcare costs exceed 14% of the American Gross Domestic Product (GDP), medical laboratory services continue to provide a widely used service, contributing upwards of 80% of the patient information used by clinicians to make

diagnostic decisions, while these laboratory services comprise only 5% of a typical hospital budget (www.ascls.org/position/scope_of_practice.asp). Secondly, hospitals in the United States are expanding specialized services, such as coronary care and cancer units, as biomedical manufacturers develop more advanced technologies and electronic health information systems. Consequently, clinical laboratory scientists/medical technologists/biomedical scientists are facing increasing demands to use laboratory instruments which are becoming increasingly more specialized and sophisticated, and to hence undergo training of the laboratory staff. The workforce shortage and consolidation of laboratory services has created a two-tiered group of general and specialist laboratory personnel in the United States. Generalists tend to work in small hospitals or doctor's laboratories serving group medical practices, while specialists tend to work in hospital medical centers or specialized private laboratories (Loweth Associates, 2001).

The understaffing of biomedical scientists has contributed to the healthcare industry crisis in certain areas across the United Kingdom (see section 6.3 for details). According to Alan Potter, chief executive of the Institute of Biomedical Science, some laboratories have resorted to using untrained and unqualified staff to cover their workload (www.ibms.org). Since biomedical scientists play a crucial role in terms of staffing laboratories within National Health Service (NHS) hospitals, NHS recruitment and retention of biomedical scientists is essential to ameliorate the laboratory workforce shortage. The increased salary scales and the introduction of a consultant-equivalent biomedical scientist could attract more biomedical scientists to work in NHS hospital laboratories. Additionally, from 1 April 2003, the Institute of Biomedical Science, on behalf of the Health Professions Council, assumed the role of assessing overseas

applications for entry to the biomedical scientists' register, which has the potential to expand the laboratory workforce in the United Kingdom.

6.5 Laboratory Workforce Trends And Projections in the United Kingdom and the United States

Published reports are available on recent and current healthcare workforce shortages in the United Kingdom and the United States, especially in high demand areas such as laboratory personnel (Crisis or Opportunity?: Health Care personnel Shortage Task Force www.wtb.wa.gov/publications; Mass, 2002; Hofherr, Francis, Peddecord, and Krolak, 2003) In terms of the laboratory workforce, problems in the recruitment and retention of qualified laboratory professionals continue across both countries.

6.5.1 The Laboratory Personnel Shortage in the United Kingdom

The laboratory personnel shortages have been reported in the United Kingdom. In 1999 for example, according to a survey by the Manufacturing, Science and Finance Union, only 50% of advertised posts for biomedical scientists were filled after the first advertisement and 82% of medical laboratories with budgeted vacant positions received fewer than three applications. This problem could be further exacerbated by the large numbers of biomedical scientists who are nearing retirement ages (www.ibms.org/cgi-bin/news/display.cgi?config=press&contref=943289920). A number of reports have cited as factors contributing to the long-term laboratory workforce shortages and growing job dissatisfaction among laboratory personnel: low salaries, lack of laboratory career advancement opportunities, increased workload, the rising age of the laboratory

workforce, and competition from more attractive careers in the Science and Technology Industry (Castillo, 2000; Ward-Cook, Daniels, and Brito, 2000; Scottish Medical and Scientific Advisory Committee, 2001).

6.5.2. The Laboratory Personnel Shortage in the United States

That the American laboratory workforce shortage is worsening is evidenced by the United States Bureau of Labor Statistics estimate that there will be 122,000 open job positions for medical technologists and technicians due to net growth and net replacement of laboratory professionals who will leave the field or retire by 2010. Thus, approximately 13,500 medical technologists and technicians will be needed each year in the laboratory workforce from 2002 to 2010. However, the approximate number of graduates from accredited medical laboratory science programs is less than 5,000 each year, leaving an annual shortage of more than 8,000 qualified laboratory personnel (Hecker, 2001).

6.6 Recent Strategies to Ameliorate the Laboratory Personnel Shortage in Both Countries

In light of concerns over the impact of the growing laboratory workforce crisis across the British and American healthcare systems, professional bodies within the National Health Service in the United Kingdom and the healthcare industry in the United States recognized the need to bring the laboratory personnel shortage issue to the national policy arenas. As previously indicated in section 6.1.1, healthcare reforms in the United Kingdom were outlined in the NHS documents "*Making the Change: A Strategy for the*

Professions in Healthcare Science" in February 2001 and the *NHS Plan: A Plan for Investment, A Plan for Reform,* launched in 2000 (www.nhs.uk/nhsplan). "Making the Change' set the framework for the way Healthcare Scientists needed to develop and plan for the changing healthcare environment of the future (National Health Service, 2001). Furthermore, critical issues such as recruitment, retention, training, salaries, and changes in workforce patterns within the NHS Trust hospital's pathology services were also cited in Cumbria & Lancashire NHS Workforce Development Confederation Reports in 2001 and 2003 (Crowther-Cottam, 2001; Broom, 2003).

In the United States, the American Society for Clinical Pathology's Board of Registry (ASCP-BOR) wage and vacancy surveys, conducted annually, have documented the closure of accredited medical laboratory education programs and the declining number of certified laboratory professionals in the United States since the 1990s. In 2002, ASCP-BOR collaborated for the first time on the wage and vacancy survey with the San Francisco Center for California Workforce Studies and the University of California. This 2002 survey indicated that rural communities across the United States were still having difficulty in filling laboratory positions and a significant number of laboratories had to resort to hiring temporary staff and non-certified individuals to fill positions, with the additional use of financial incentives (www.ascp.org/bor/center/center_research.asp). The Coordinating Council on the Clinical Laboratory Workforce (CCCLW) of American laboratory professional bodies continues to address actively the laboratory shortage by working closely with congressional members in Washington, DC to seek viable solutions to the laboratory workforce shortage and to attract individuals into the laboratory profession (Caskey, 2003). These combined efforts led to the Medical Laboratory

Personnel Shortage Act of 2001 and a 26.4% increase in funding in 2003 of the Allied Health Project Grants program. This 'Grant Program' gives priority consideration to those projects for schools experiencing shortages and involved in training allied professionals such as medical technologists/clinical laboratory scientists/biomedical scientists (www.asahp.org/grantsprogram.html).

6.7 The Changing Landscape of Higher Education in the United Kingdom and the United States

For the past two decades, laboratory academic and training programs in the United States have been faced with program closures, declining student enrollments, and severe budget cuts. In response, American program directors have sought new and more cost-effective means of delivering their curricula. With the wide-spread use of the Internet and World Wide Web, numerous hospital and university-based laboratory programs have chosen web-enhanced instructional strategies to increase student enrollments and to offset expenses associated with traditional formats for delivering their courses/modules. As William Draves, the American author of *Teaching Online*, states: "half of all learning in the 21st century will be online" (www.williamdraves.com). In view of the increasing number of universities and colleges offering technology-mediated instruction at a distance, the Higher Learning Commission recently published a report entitled "Best Practices for Electronically Offered Degree and Certificate Programs" (www.ncahigherlearningcommission.org/resources/electronic_degrees). The Higher Learning Commission is under the aegis of the United States Secretary of Education and the Committee on Recognition of Postsecondary Accreditation and operates under the

Council on Higher Education Accreditation (www.ncahigherlearningcommission.org). The Commission has earned a national and international reputation for leadership in defining quality in the higher education marketplace. In 1997, the Quality Assurance Agency for Higher Education (QAA) was established in the United Kingdom with a similar purpose to that of the Commission, to provide integrated quality assurance services for British universities and colleges of higher education (www.qaa.ac.uk). In a recent survey of American clinical laboratory science (CLS) programs which offer their curriculum online, Campbell reported that these CLS programs experienced an increase in student enrollment and therefore graduated more students to fill laboratory vacancies and has deduced from this study that distance learning is charting a new course for CLS education in the new Millennium (Campbell, 2003). At my own university, many campus programs deliver their curricula using web-based or web-augmented formats. In order to address issues associated with technology mediated distance education such as access, security risks, best practices, quality of instruction, student outcomes, and uniform standards, a university-wide "On-line Task Force," on which I serve as the school representative, was created in 2003.

In the United Kingdom, Robin Middlehurst (2002), from the University of Surrey, addressed the matter of how borderless developments in higher education are changing the educational landscape. Middlehurst contends that 'borderless education developments' such as emerging corporate e-university initiatives, transnational education programs, international consortia and the issues they arouse are germane to mutual recognition systems and quality assurance arrangements of different countries (Middlehurst, 2002). Furthermore, Middlehurst presented a comprehensive picture of

borderless higher education at a United Nations Educational, Scientific and Cultural Organization (UNESCO)-sponsored global forum in October 2002. In his closing remarks, he concedes "our old binary distinctions between education for 'public good' or 'private gain' seem increasingly anachronistic" (www.unesco.org/education/studyinabroad/index.html).

On a personal note, as a doctoral student, educator, and laboratory professional, I have embraced distance education and advanced information/computer technologies for the "public good" and I recognize the value of e-learning, e-health, and e-commerce as evidenced by personal experiences and publications on these subject matters (Abumuhor and Hope Kearns, 2000; Holmes and Hope Kearns, 2003; Hope Kearns and Holmes, 2002; Jaggi and Hope Kearns, 2000; and Hope 1999). Based on my background and professional experience, I view emerging technologies as valuable tools that can enhance and improve the quality of healthcare and education services, especially when they are used for the 'public good' and not just merely for 'private gain'!

6.8 Current Trends in Competency Assessment in the United Kingdom and the United States

Test methodologies and instrument systems used in the medical laboratory profession are changing rapidly worldwide such as DNA fingerprinting and Polymerase Chain Reaction (PCR) techniques, tissue typing, and the like. As the laboratory industry grows, so does the need for continuing competencies of laboratory practitioners. Healthcare systems are expected to provide safe healthcare practitioners in all service areas and the

public demands that healthcare professionals meet minimal levels of competence throughout their careers.

As previously indicated in Chapter 1, Section 1.2, pre-employment competency assessment schemes for clinical/biomedical scientists include national certification, registration and licensure. In the United States, certification is the process by which a credentialing body grants recognition of competence to a person who meets certain predetermined qualifications by that body and affirms that the person has demonstrated the knowledge to perform his or her essential tasks in the laboratory. Eligibility for certification is based upon successful completion of both an accredited academic laboratory program and an approved clinical training program, and a written certification examination. The American Society for Clinical Pathology Board of Registry (ASCP-BOR), the National Credentialing Agency for Laboratory Personnel (NCA), and the American Medical Technologists (AMT) are nongovernmental certification bodies that provide competency-based certification examinations in various categories of laboratory medicine. In addition to certification of laboratory personnel, licensure is a statutory requirement for medical laboratory practitioners in 11 states in the United States.

In the United Kingdom, the equivalent of certification is registration: a process by which a statutory regulatory body grants recognition to an individual who meets the standards of proficiency for safe and effective practice of registrant biomedical scientists. The Institute of Biomedical Science (IBMS) is the relevant awarding body and can provide certificates of competence to biomedical scientists who wish to seek registration by the Health Professions Council (HPC). The HPC became the statutory regulatory body for biomedical scientists under the 1999 Health Act. Eligibility routes for registration of

biomedical scientists require a record of completion of education and training for the registration of biomedical scientists in accordance with the HPC standards of proficiency, a pre-registration practitioner training portfolio and documented evidence of the training program.

6.9 Competency Assessment in the Workplace in the United Kingdom and the United States

Competency assessment programs are an integral part of the medical laboratory setting in the United States. The Clinical Laboratory Improvement Amendments (CLIA) of 1988 mandated that clinical laboratories administer competency testing on an annual basis to both technical and non-technical staff (Federal Register, 1992). Harmening (1995) identified the core competencies that should be assessed as technical skills, decision making and judgment, communication skills, and knowledge base. According to the National Committee for Clinical Laboratory Standards (1996), competency assessment programs should be based on regulatory, accrediting agency, and organizational requirements. Schiffgens and Bush (2001) recommended that a combination of methods should be used to assess laboratory staff competencies, ranging from a review of quality control and quality assurance indicators to written tests, evaluation of proficiency testing performance, and direct observation.

Beyond their initial certification/registration and licensure (where applicable), laboratory practitioners need to maintain continued competency throughout their career. In the United Kingdom, the HPC sets the standards of proficiency for safe and effective practice that they expect registered biomedical scientists to continue to meet in order to

maintain their registration throughout their career. The HPC proficiency standards include generic standards that must be met by all of the 12 healthcare science professions that HPC registers and profession- specific elements of the standards for biomedical scientists (http://www.hpc-uk.org/publications/standards_of_proficiency_ml.htm). IBMS assesses competency to practice against the HPC Standards of Proficiency by evaluating an applicant's record of completion of education, laboratory training, and evidence of professional knowledge, understanding and skills that are documented in the IBMS "Registration Portfolio." The IBMS Certificate of Competence Portfolio provides proof of the applicant's education and training and documentation of professional competence and fitness to practice in order to become eligible for registration with the HPC. The Standards of Proficiency issued by the HPC in July 2003 is an extreme departure from the registration regulations for biomedical scientists required by the former Council for Professions Supplementary to Medicine (CPSM). IBMS has the authority to award a Certificate of Competence for biomedical scientists who wish to become registered and maintain their registration with the HPC and competence-related matters are dealt with by the IBMS Competence Committee. Based on my observations and careful evaluation of the HPC Standards of Proficiency and the IBMS Certificate of Competence Portfolio, in addition to continuing professional development (CPD) and job performance reviews, I recommend that laboratories administer competency testing to all staff, including non-technical staff, employed in laboratory services the United Kingdom. I would suggest that laboratory managers could work together with IBMS to establish a formal competency assessment program ranging from written documentation of quality control,

quality assurance measures and workplace safety, to proficiency testing performance indicators.

6.10 Trends in Continuing Professional Development in the United Kingdom and the United States

There is an array of continuing professional development (CPD) activities from which laboratory personnel can choose, such as self-assessment exercises, scientific publications, university courses, and attendance or presentations at professional conferences. With the exception of mandatory CPD for renewal of annual state licensure, CPD has been voluntary for the laboratory profession in the United States. Since 1992, IBMS has been conducting a voluntary CPD scheme in the United Kingdom. It is interesting to note that in a 1998 report entitled "Project EVETSIN," published by the University of Sussex Institute of Education, there was strong support for HPC to introduce mandatory CPD and it was proposed that CPD should test competency of staff (Eraut *et al.*, 1999). Moreover, the Broom report recommends that NHS Trusts "develop and support the use of personal portfolios and reflective diaries in the Healthcare professions to support CPD and that CPD should be linked to the Trusts' appraisals and Personal Development Plans" (Broom, 2003). I concur with Mr. Broom's recommendation on the use of personal portfolios. I discussed my use of electronic portfolios in the classroom setting during a meeting with Mr. Broom at the University of Central Lancashire in July 2003 (Hope Kearns, Holmes and Gallicchio, 2003). The value of personal portfolios was corroborated by numerous speakers at the ELearnChina Conference that convened in Edinburgh, the United Kingdom in July 2003

(www.elearnchina.org), and at the first international conference on the e-portfolio in October 2003 in Poitiers, France (www.europortfolio.org).

In 1980, the National Certification Agency for Laboratory Personnel (NCA) established a recertification policy as a scheme for NCA certified laboratory practitioners in the United States to demonstrate their continued competence to peers, patients, and their employers. Eligibility routes for recertification are based upon documented evidence of continuing education that meets NCA requirements or taking a re-certification examination (www.nca-info.org/recertification.asp). The ASCP Board of Registry has been studying the issue of continued competence since 1977. Based on their findings, the ASCP-BOR developed a voluntary continuing competence recognition program in 1997 to allow certified laboratory professionals to demonstrate their proficiency in medical laboratory areas in which they had been working. Known as the Certification Maintenance Program (CMP), it is required for all laboratory professionals who are certified, with effect from 1 January 2004 in a variety of categories including, but not limited to: medical technologists, medical laboratory technicians, histotechnologists, histotechnicians, phlebotomy technicians, and cytotechnologists. Upon successful completion of certification starting in 2004, a time-limited certificate will be issued by ASCP-BOR along with information for completion of the CMP (Ward-Cook, 2003).

6.11 Regulations and Standards in the United Kingdom and the United States

In the United Kingdom, healthcare professionals must be registered by defined statutory regulations, and professional staff qualifications are awarded by pertinent professional bodies, such as Royal Colleges (for doctors) and the Health Professions

Council (for health professions supplementary to medicine). Occupational standards for the Healthcare Science professions have been cited in the "Changing Workforce Programme" document as a measure contributing to improving the quality of healthcare (www.modern.nhs/uk/cwp).

In the United States, there are no mandatory standards that govern certification of health professionals, and nor are there mandatory standards that govern certification bodies. However, there are currently state-mandated licenses for select health professions, including the laboratory profession. Healthcare employers and consumers of healthcare services recognize the value of certification and registration of health professionals as it relates to quality assurance and patient safety. Certification bodies also recognize the importance of accreditation. Healthcare-related certifying bodies in the United States have sought voluntarily international accreditation from a number of accreditation organizations, such as the National Commission for Certifying Agencies (NCCA), the accrediting arm of the National Organization for Competency Assurance (NOCA) and the American National Standards Institute (ANSI), which accredits personnel certification bodies operating under ISO/IEC 17024 (Maronde, 1997). NCCA accredits certification entities such as the Healthcare Quality Certification Board (HQCB) in the field of healthcare quality management (www.cphq.org/backgrnd.html) and the American Medical Technologists (AMT) in the field of laboratory medicine (www.amt1.com/site/epage/9359_315.htm; National Organization for Competency Assurance, 2002).

There are two major sets of regulations that influence the ability of international laboratory professionals who obtain ASCP Board of Registry certification to work in the

United States. One is the Clinical Laboratory Improvement Amendments (CLIA) regulations which require that clinical laboratory scientists have graduated from an accredited program. The Centers for Medicare and Medicaid Services (CMS) regulate all medical laboratory testing performed on humans in the United States through the CLIA program. The primary objective of the CLIA program is to ensure quality laboratory testing in the approximately 175,000 laboratory entities that CLIA covers (www.cms.hhs.gov/clia). The United States Department of Homeland Security (DHS) requires foreign healthcare workers, including medical technologists (MT) and Medical Laboratory Technicians (MLT) to meet certain requirements in order to obtain a visa to work in the United States. The certification requirements for foreign health workers regulation appears in Title II, Section 343 of the 1996 regulation "Illegal Immigration Reform and Immigrant Responsibility Act" (www.takatalaw.com/us/iract96.html). These requirements include proficiency in the English language, having an unencumbered license to practice in a health profession, and that their professional education is comparable to that of the United States. In the United Kingdom, the IBMS uses the same "Certificate of Competence Portfolio" procedure to assess foreign educated and trained applicants who wish to be registered as biomedical scientists with the Health Professions Council.

As discussed in Chapter 1, the regulations for foreign-educated laboratory personnel in the United States are enforced by the International Commission on Health Care Professions (ICHP), a division of the Commission on Graduates of Foreign Nursing Schools (CGFNS). CGFNS has been recognized by the United States Congress as an agency to conduct the screening process. ICHP evaluates and certifies the credentials of

foreign-educated medical technologists and medical technicians who are seeking an immigrant "permanent" visa or adjustment of their status to permanent residency in the United States. ICHP developed the Standards for Medical Technology applicants who applied to the newly created VisaScreen Program. Copies of the ICHP/CGFNS Medical Technology and Medical Laboratory Technician Standards developed by the ICHP Laboratory Committee.

The Temporary Status by Qualification (TSQ) credentialing program provided by the National Credentialing Agency (NCA) for Laboratory Personnel offers international laboratory professionals the opportunity to demonstrate their knowledge of laboratory medicine by taking the NCA national certification examination (www.nca-info.org/otherncaprograms.asp).

Both the VisaScreen and TSQ programs were designed to ensure that laboratory professionals are qualified, capable, and adequately prepared to perform the designated laboratory services for which they are employed and authorized to provide in the United States. Although these national programs are relatively new, they have increased the opportunities for qualified foreign educated laboratory professionals to seek employment in laboratories in the United States. As previously stated, foreign educated laboratory professionals seeking employment opportunities in laboratories in the United Kingdom must satisfy the Health Professions Council (HPC) Standards of Proficiency for registration with the HPC and undergo the IBMS certification of competency assessment process.

At the state level, this author has been working with the Project Director of the Los Angeles County Welcome Back International Health Worker Assistance Center

(LAWBC). I serve as mentor to immigrant healthcare educated clients residing in California who are interested in a career in laboratory medicine. The LAWBC seeks to build on community assets to address the need for a healthcare workforce that better reflects the linguistic, racial, and cultural diversity of California's population. This Welcome Back Program has encountered over 9,000 immigrant health professionals from 115 countries that reside in California. 'Welcome Back' has achieved great success for its clients in validating over 1,000 client credentials, obtaining employment for 203 clients in the healthcare sector, and obtaining alternative careers, including laboratory medicine, for 69 clients (Oliva and Fernández-Peña, 2004).

In the absence of mutual recognition agreements between the United States and United Kingdom laboratory credentialing authorities at this time, the Welcome Back, VisaScreen and TSQ programs are essential steps to take for laboratory professionals who wish to work in the United States. In roads have been made for prospective foreign laboratory professionals who wish to work in the United Kingdom, as evidenced by the IBMS representation on the American Society for Clinical Pathology Board of Registry's Globalization Task Force and the pending visit of the IBMS Executive Director's scheduled visit to Australia.

6.12 Mobility of Laboratory Professionals in the United States and Europe

The mobility of health has been a priority in both the American and European political agendas (Berman, 2001). To facilitate mobility of health professionals, United States and European Union legislation has established different ways of recognizing professional qualifications that would enable the migration of highly qualified professionals such as

the aforementioned VisaScreen program functions in the United States (www.cgfns.org/cgfns/index.html). In Europe, a special session on the topic of mobility of health professionals was convened by stakeholders of the European Union Health Policy Forum (EHPF) in June 2003. This session led to a document entitled "Mobility of Health Professionals" (www.epsu.org/a/346). Key issues that were dealt with by EHPF stakeholders in this document were the impact of free movement of health professionals on quality healthcare and patient safety, the need for clear and transparent recognition procedures, and the need for high quality standards to be developed across the European Union. The quality issues raised related to mobility are important for the reasons stated above. It has been agreed by all parties that quality standards and patient safety will not be compromised.

What is sometimes missing from mobility reports are current and accurate data on the numbers of select health professionals moving from one country to another. Admittedly, data are frequently available on the movement of nurses and doctors in the European Community but, with few exceptions, labor force surveys don't usually categorize in terms of the other health professions (Jinks, Ong, and Paton, 2000; Lipson, 2002; Nicholas, 2002; www.physio-europe.org/pdf/Mobility.pdf; European Federation of Public Service Unions www.epsu.org/a/346; European Public Health Alliance www.epha.org/a/521; Biviano and Makarehchi, 2002). Other than the Skar report, little to no other current published research was readily available on the movement of laboratory professionals (Skar, 2001; Maronde, 1997). Skar (2001) reported that 82 medical technologists (MT) submitted applications for recognition of qualifications in European Union Member States from 1993 to 1996. Skar also cited 1999 United Kingdom

registration data obtained from the former Council for Professions Supplementary to Medicine (CPSM; recently renamed as the Health Professions Council),that over 300 registered laboratory professionals from European Union Member States and overseas countries had migrated to the United Kingdom (Skar, 2001). Based on information obtained from the National Certification Agency for Laboratory Personnel (NCA) and the Council for Graduates of Foreign Nursing Schools (CGFNS), I was informed that approximately 500 internationally trained laboratory professionals submitted applications for visa credentials assessment and American laboratory certifications from 1996 to present.

Although reports on the number of laboratory professionals who cross borders are rare, I suspect that there is a higher rate of movement for laboratory professionals than these data demonstrate. To this end, I recommend that American and British professional bodies and regulatory agencies work together to standardize the statistical tracking mechanisms on the cross-border movement and employment status of migrant laboratory professionals. In addition, I recommend that statistical data on cross-border movement and the employment status of migrant laboratory professionals be collected on a regular basis and made available to the public, without providing any details about the laboratory professional.

6.13 Outcomes from Multinational Forums

I wish to report some very exciting developments that evolved from my research-related activities and professional connections. None of the activities that I present below

would have been possible without the ongoing support and cooperation of my thesis committee, professional colleagues, students, family, and friends.

Throughout this course of study, I delivered peer-reviewed presentations on various stages of my research at 8 professional conferences that convened in 6 different countries including Canada, the Netherlands, Portugal, the United Kingdom, the United States, and Sweden.

Based on the fine reputation of the sponsoring organizations, these conferences attracted large, multidisciplinary, international audiences. Organizations included the Institute of Biomedical Science (www.ibms.org); the Association for Schools of Allied Health Professions (www.asahp.org); the American Society for Clinical Laboratory Science (www.ascls.org); multi-national corporations for ELearnChina (http://aisl.intothenet.co.uk/elearnchina/speakers.asp); the New Alliance Consortium for Nursing and Allied Health for International Cooperation (www.pace.edu/nacnah); the Consortium of Institutes of Higher Education in Health and Rehabilitation in Europe (www.cohehre.org); and the International Federation of Biomedical Laboratory Science (www.ifbls.org), formerly named the International Association of Medical Laboratory Technologists.

Participation at these international forums afforded me the unique opportunity to share preliminary findings of my research and to receive valuable feedback from another cadre of professionals from the international community. Finally, informational exchanges and brainstorming with conference participants raised my awareness of the international value of this study and the global impact that my research could have on the laboratory profession.

6.14 Conclusion

This research journey led me to far away places, figuratively and literally, in hopes of creating new opportunities and providing future directions for fellow members of the international laboratory community. It is my fervent wish that this research will continue impacting on the laboratory profession in positive ways for years to come. I have been challenged and enthralled by the research process and the writing of this thesis. As I approach the finish line of my doctoral studies, I look forward to new adventures as I embark on the next stage of my journey, the implementation of the model international clinical/biomedical science program that evolved from this survey research. The next and final chapter of this thesis has been reserved for a comprehensive discussion of this exciting student exchange model.

Another positive outcome from this research was the newly established Globalization Task Force and the welcomed opportunity to work with our British and Australian colleagues on the creation of a trilateral pilot project to explore opportunities for working together regarding credentialing of medical laboratory personnel. I shall now describe one other research endeavor that began as a daydream while strolling with my mentor through Buckingham Palace Gardens in the summer of 2002. It was then and there that we had the inspiration to create a student-run model that would foster student development and student research in the laboratory sciences, internationally. We aptly named our project "INSPIRED" that would serve as the emblem and acronym for Institutional Student and Professional International Research and Educational Development. The primary goal of Project INSPIRED was to establish alliances with academic institutional partners, community partners, and professional organization

partners to: address the medical laboratory workforce shortage crisis, ensure an adequate supply of qualified laboratory personnel essential to staffing national emergency preparedness laboratory networks to respond to potential threats of homeland bioterrorism, and to reduce the linguistic and education barriers for the underutilized pool of internationally trained healthcare professionals who were interested in working in laboratory medicine within the United States healthcare system. In February 2003, we delivered a paper presenting our INSPIRED model at the Consortium of Institutes of Higher Education in Health and Rehabilitation in Europe (COHEHRE) Conference in Maastricht, the Netherlands (Hope Kearns, Gallicchio, and Holmes, 2002. Unpublished Report).

Project INSPIRED, I believe, is another viable and creative solution to the laboratory personnel shortage by utilizing the experience and expertise of internationally educated and experienced healthcare professionals residing in the United States. The critical shortage of professionals trained in medical laboratory technology could be eased by providing transition preparation and job placement opportunities for those wishing to engage in the career paths for which they have the essential educational and professional background complementary to the areas of clinical laboratory science. This project provides unique pathway for entry into clinical laboratory settings at the national and international levels. The model for *INSPIRED* was influenced by a former collaborative project entitled "The Middle School Mentoring Program in Allied Health: A Proposed Model" in which I partook during the 2000 National Coalition for Allied Health Leadership Program in Washington, DC (Gonzalez, Hope Kearns, Lafferty, Lampignano, and Pappas, 2000).

In conclusion, I trust that my research outcomes have charted a new course that will move the laboratory profession forward in the 21st Century and beyond. I assert that this study and the joint ventures that evolved from this research -- the transatlantic student exchange program -- the INSPIRED project -- and the trilateral pilot project, will foster increased mobility of laboratory professionals, develop global awareness, promote cross-cultural competencies, and better serve the global laboratory workforce of the future.

"How shall I talk of the sea to the frog,
if it has never left his pond?
How shall I talk of the frost to the bird of the summerland,
if it has never left the land of its birth?
How shall I talk of life with the sage,
if he is a prisoner of his doctrine?"

Chung Tsu, 4th Century B.C.

Chapter 7

DEVELOPMENT OF AN INTERNATIONAL MODEL PROGRAM FOR LABORATORY SCIENCES

"Not everything that can be counted counts and not everything that counts can be counted" Albert Einstein

7.1 Stage Two: The Impetus for a Transatlantic Exchange Program

Despite the challenges of the current laboratory environment, such as workforce shortages, financial cutbacks, and laboratory science curricula restrictions imposed by credentialing agencies and the government, the results of this survey were very enlightening in terms of international exchange program information. Specifically, whereas only 10% of the programs surveyed reported that they were currently engaged in international exchanges, nearly 50 percent (47.1%) of the respondents indicated that they were interested in starting an international exchange program. Comments such as "I think it would be an absolutely wonderful experience that CLS students from both countries would benefit from;" "would be open to exploring the possibility;" "we already have such a program for laboratory practical experience--what we have seen, both the host institution and the visiting students from Australia, have benefited from the experience;" "very interested. Our university already has an active international student program in biotechnology;" "we would be interested in having an exchange program with any country that has a similar CLS program;" "we are open to new sites and new ideas" support the value of international student exchanges that have been reported in the literature. In knowing that partnerships forged through international exchange programs secure a better future for all countries worldwide, the United States Department of State and the United States Department of Education endorsed the fourth annual global celebration of International Education Week, 17-21 November 2003. United States

Education Secretary Rod Paige said "to better understand this new 21st Century world, we must teach our students to understand world issues and their connections to them" (http://exchanges.state.gov/iew/statements/mediantoe_nov 13.htm). Of the 9.6% of respondents that said they were unsure about starting this type of program, the explanations given from the majority of respondents were not related to a lack of interest, but rather related to timing, resource, and credentialing issues as evidenced by comments such as "not at this time, in the future we might consider it;" "United Kingdom credentials are not accepted by the ASCP BOR;" "I'm not opposed, but we have a very small program, with no available housing;" " I don't believe I'd get financial or administrative support at this time;" "I'd be happy to start such a program, but not feasible at the current time due to lack of resources;" and "I would imagine our students would find the program cost prohibitive, unless they were subsidized in some way." Indeed the fruitful explanations derived from the aforementioned substantive comments produced findings that were clearly not reflected in the numeric data derived from this particular question "would you be interested in starting an international exchange program at your institution?" As Miles and Huberman suggest, linking qualitative and quantitative data can help during analysis by validating, clarifying, interpreting, and illustrating quantitative findings as well as strengthening and revising theory (Miles and Huberman, 1994). Denzin and Lincoln (1994) point out that both the quantitative and qualitative researcher express concern about the subject's point of view. Qualitative researchers argue that that they can get closer to the subject's perspective through detailed observation and interviewing, whereas quantitative investigators are seldom able to capture their subject's perspectives because they must rely on more inferential empirical

methods and materials. According to Patten (2002) "because quantitative and qualitative methods involve differing strengths and weaknesses, they constitute alternative, but not mutually exclusive, strategies for research." The findings of this research highlight Miles and Huberman's (1994) point in that the qualitative data was particularly helpful and appropriate for this study.

Along with the encouragement of my research colleagues who were familiar with the valuable information gleaned from this study and in consultation with colleagues from the ASCP-BOR Globalization Task Force and Transatlantic Health Sciences Consortium, I set out to develop an international exchange program that incorporates key program recommendations that evolved from this study.

7.2 Background Information

I have been an active member of the ASCP Board of Registry (ASCP-BOR) Globalization Task Force since its inception and a member of the Transatlantic Health Science Consortium since 2000. The ASCP Board of Registry was one of the credentialing agencies that endorsed my survey research. The *Task Force*, of which I am a charter member, was established in 2002 to explore the feasibility of globalization for the ASCP-BOR and to make recommendations to the Board of Governors. *Task Force* members include laboratory administrators, representatives from the Institute of Biomedical Science (IBMS) and the Australian Institute of Medical Scientists (AIMS), laboratory program directors in the United States and overseas, clinicians, and educators. ASCP-BOR offers 25 certifications that fall within the following 4 categories:

technologist, technician, specialist, and diplomate (see Table 7.1) (www.ascp.prg/bor/certification/index.asp).

The *Task Force* has met periodically during the course of this study to discuss key issues related to globalization of the ASCP process, international certification, outcomes of my survey research, and preparations for international presentations and publications. Among other activities, the *Task Force* has received requests from several countries outside the United States to either transport or translate select ASCP-BOR certification examinations. In January 2004, the *Task Force* met in Los Angeles to address the aforementioned topics and to prepare a written report highlighting the *Task Force* activities. The report also included recommendations of the *Task Force* related to specific globalization action steps and time lines. Details of the Task Force globalization initiatives will be presented in a paper that I co-authored entitled "Globalizing Laboratory Personnel: Quality Assessment and Management Mechanisms." This paper was accepted for presentation at the International Federation of Biomedical Laboratory Science 26th Congress that is scheduled to convene in Stockholm in June 2004.

The Transatlantic Health Science Consortium was created in 1999 to foster international education and research alliances among *Consortium* partners from European and North American higher education institutions. The *Consortium* membership consists of administrators, educators, and practitioners representing a number of allied health-related professional programs such as clinical and biomedical sciences, speech-language pathology, physiotherapy, occupational therapy, and more. The *Consortium* partner

Table 7.1 Laboratory Certifications Offered by the American Society for Clinical Pathology Board of Registry (n=24)

Technologist	**Technician**	**Specialist**	**Diplomate**
Medical Technologist (MT)	Apheresis Technician (AT)	Specialist in Blood Banking (SBB)	Diplomate in Laboratory Management (DLM)
Histotechnologist (HTL)	Donor Phlebotomy Technician (DPT)	Specialist in Chemistry (SC)	
Cytotechnologist (CT)	Histotechnician (HT)	Specialist in Cytotechnology (SCT)	
Technologist in Blood Banking (BB)	Medical Laboratory Technician (MLT)	Specialist in Hematology (SH)	
Technologist in Chemistry (C)	Phlebotomy Technician (PBT)	Specialist in Immunology (SI)	
Technologist in Hematology (H)		Specialist in Laboratory Safety (SLS)	
Technologist in Immunology (I)		Specialist in Microbiology (SM)	
Technologist in Microbiology (M)		Specialist in Virology (SV)	
Technologist in Molecular Pathology (MP)		Hemapheresis Practitioner (HP)	

The table above lists the categories of certification offered by the American Society for Clinical Pathology.

institutions collectively assign institutional representatives to serve as members of an Advisory Committee. This group has oversight for all operations of *Consortium* activities. The Advisory Committee meets regularly, rotating between Europe and North America in order to facilitate the organization of the *Consortium,* to expand student and faculty exchanges among *Consortium* member institutions, and to facilitate solutions to present and emerging issues amongst the *Consortium* partners. At a *Consortium* meeting in Maastricht in February 2003, I presented the preliminary findings of this research to the members who were present, from the United States, Puerto Rico, and Sweden. We discussed the notion of developing a student exchange program focused on laboratory sciences' students enrolled in participating *Consortium* member institutions in order to address both the acute laboratory workforce shortage, bioterrorism threat, and the technology revolution that has arisen from the research in areas such as molecular medicine and diagnostic imaging. Laboratory-based technologies will be the center of the technology revolution as the human genome project continues to unravel the molecular basis of disease. This information will change how medicine and healthcare delivery services will be practiced in the industrialized nations with implications that will also impact developing countries. Advanced technologies will generate new tests and disease markers requiring laboratory personnel to have more specific skills and training than is currently in practice. Since the performance sites for the development of advanced technologies are currently being produced in biotechnology and pharmaceutical companies, in addition to the United States government, quality educated and trained laboratory- based professionals will be highly sought after regarding future employment. Laboratory - based technicians who have been trained in the clinical arena will soon need

additional training and new skills to effectively meet the demands associated with the technical revolution in molecular medicine. Already, many biotechnology and pharmaceutical companies have expanded their services across international borders. Hence, by providing students with an international experience that will improve their technical training skills as well as improve their cross-cultural competencies, may allow graduates to become more employable to international companies.

7.3 Participating Partner Institutions

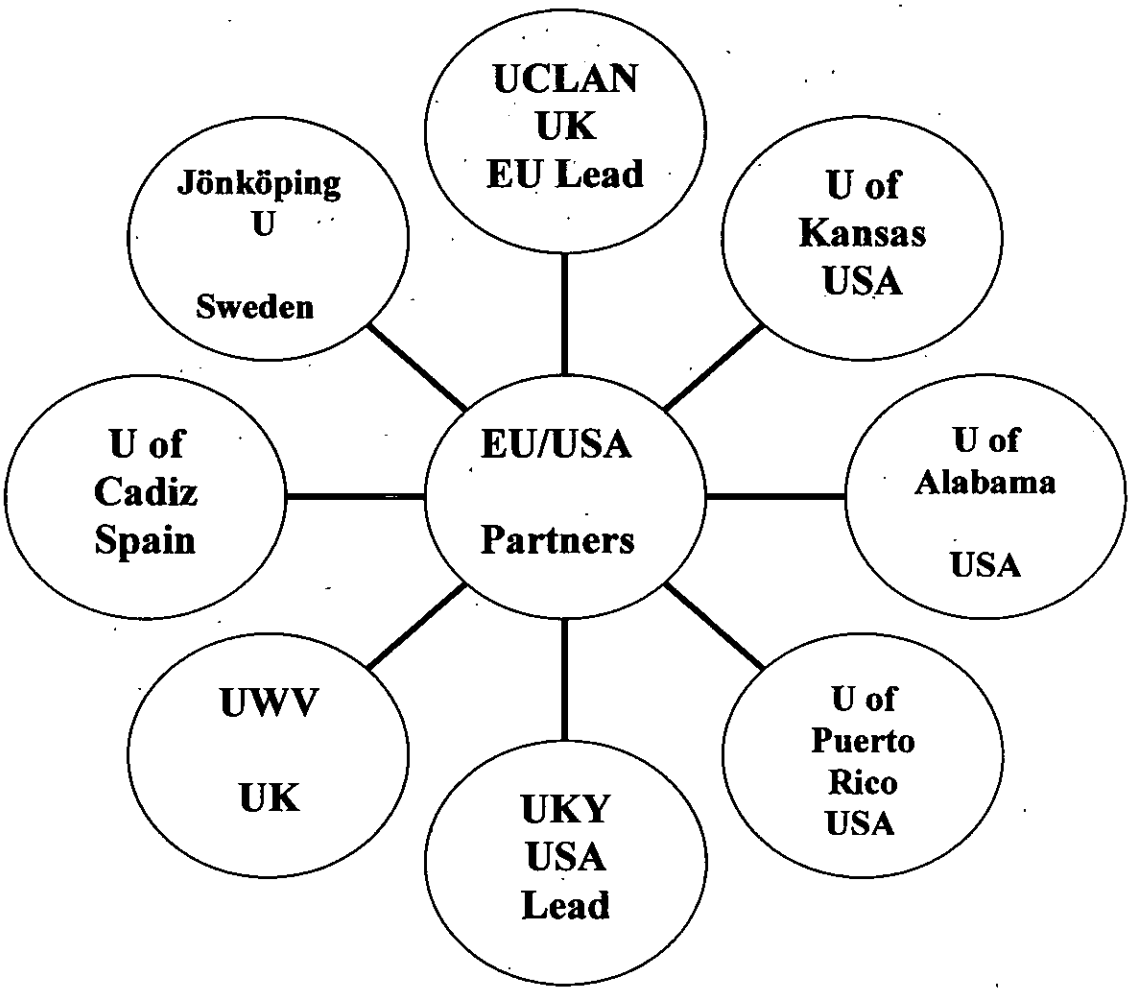
All *Consortium* members present at the Maastricht meeting agreed to participate in the proposed exchange program. The institutions they represented were: University of Kentucky (UKY), University of Puerto Rico (UPR), Kansas University (KU) and Jönköping University (JPU) in Sweden. It was decided that a viable exchange with only one European institution and three American institutions was unbalanced and not appropriate. Since the University of Kentucky, College of Health Sciences and the British Universities of Wolverhampton (UWV) and Central Lancashire already had extant agreements that allowed for student exchange; the University of Kansas had an existing agreement with the University of Wolverhampton; and the University of Central Lancashire (UCLAN) had an existing agreement with University of Cadiz (UCD) in Spain, the *Consortium* decided to invite all three Universities (two British and one Spanish) to be participating partners. For a better mix, it was decided to invite the University of Alabama (UA), a new *Consortium* member institution. Those invitations led to an equal exchange between partner institutions. The four European partners included: the Universities of Wolverhampton, Central Lancashire, Jönköping, and Cadiz.

The four American partners were the Universities of Kentucky, Kansas, Puerto Rico, and Alabama. This model transatlantic partnership for clinical/biomedical sciences education is illustrated in Figure 7.1.

7.4 The American Partnership

The American partners provided three unique and different kinds of regional experiences to the European students. Alabama is a state in the deep South; Kansas is a Midwestern state; Kentucky is a border state; and Puerto Rico is an island in the Caribbean that is a bilingual (English and Spanish) speaking commonwealth. Each state or commonwealth operates within the general rubric of the so-called United States biomedical health care system, but there are also differences in access and funding in each state. Kentucky offers opportunities for unique rural clinical experiences; Kansas offers unique rural and urban clinical experiences; Alabama is a southern state with a myriad of rural issues; and Puerto Rico offers unique Caribbean rural and urban experiences to the visiting European students. The American partners agreed to contribute to the development of the comparative health systems course/module with expertise from their Health Administration faculty. The American partners will use their expertise in web-based instructional design and distance learning to contribute to the core of this project - the Comparative Health Systems course/module. The American partners agreed to use their current staff to provide complementary experiences including clinical education for the European students. Student services will be provided to the European students commensurate with the level provided for local students. The multicultural aspect of this

Figure 7.1 Illustration of the Transatlantic Model for Clinical/Biomedical Sciences



European institutional partners: University of Central Lancashire (UCLAN), lead European partner, University of Wolverhampton (UWV), Jönköping University, and University of Cadiz. American institutional partners: University of Kentucky (UKY), the lead United States partner, University of Kansas, University of Alabama, and University of Puerto Rico.

program should allow the participating partner institutions to provide opportunities for students to experience the practice of their profession in other country's health care system ultimately to broaden their experience to make them a better laboratory practitioner.

7.5 The European Community Partnership

The cooperating institutions from the European Community (EC) representing the United Kingdom, Spain and Sweden are joining together in a partnership to enhance the development of this reciprocal exchange with its American partners. All participating EC institutions have extensive experience with exchanges as part of the Socrates/Erasmus programs. This educational exchange program embarks on a new 21st Century challenge to develop an international cooperative dialogue to facilitate the training of laboratory practitioners for the transnational workforce of the future. The multicultural aspect of this program will provide a unique set of opportunities and experiences for American students to engage in the practical aspects of their European facilities and to participate in cultural and language immersion activities.

7.6 Specific Contributions of the Partner Institutions

Each of the American institutions is from a different geographic region of the United States and will expose participating exchange students to diverse populations in a unique blend of rural and urban settings. Specific contributions of the partner institutions in the United States and Puerto Rico are presented below.

7.6.1 University of Kentucky, College of Health Sciences

The University of Kentucky's College of Health Sciences is a leader in the field of international biomedical allied health care education. Since 1992, the student exchange programs offered by the College have provided international opportunities for over 200 students. The College is committed to the further development of international exchanges in biomedical allied health care education and will lend its experience and expertise to this new education exchange program. The University of Kentucky (UKY) will specifically contribute: rural clinical education and tertiary care sites such as the University's Adult and Children's Hospital and the Veterans Administration Hospital; an interdisciplinary course emphasizing team training and the United States Healthcare System; the Clinical Laboratory Science research laboratories; the Kentucky Aids Training and Education Center housed in the College; the Center for Health Policy Research; the Division of Health Services Management and the Master of Health Administration faculty; consultative resources of a Curriculum Designer and the College's Manager of Information Technology; and Masters and doctoral degrees in Clinical Laboratory Sciences. The Clinical Laboratory Science program, formerly Medical Technology, was one of the first academic-based programs in the field in the United States having been established in 1936.

7.6.2 Kansas University Medical Center, School of Allied Health

The University will provide expertise for the delivery of the Comparative Health Care Systems and Health Development course, which will be offered to exchange and local

students, enrolled in the respective programs. The Clinical Laboratory Science Department will provide training opportunities at both clinical and biomedical research laboratories. Because of its central location within the United States, the Kansas University Medical Center will provide a meeting location for the participating partners.

7.6.3 University of Puerto Rico, Medical Science Campus

As a bilingual, Hispanic institution in an island setting, the University of Puerto Rico's (UPR) School of Health Related Professions will provide a rich cultural experience for participating students from other foreign countries. Currently, the government is undergoing healthcare reforms that will also benefit students in their understanding of Puerto Rican health services. The University will also provide sites for clinical and research training. This innovative educational exchange program will provide an opportunity for international students that will be unique for these students since they will experience a bilingual cultural situation unlike anywhere in the other 50 States. This will be of "added value" to international students involved in this program.

7.6.4 University of Alabama, School of Allied Health

Located in Birmingham, Alabama, the University of Alabama (UAB) is a campus with a diverse student body that reflects the typical urban environment and cultural diversity. Started in 1945, the Medical Technology program was one of the first programs developed in the UAB Medical Center and one of the earliest in the United States.

With a long history of international activity, especially with institutions in the Middle and Far East, the organization is eager and anxious to bring its expertise now to this new

international exchange between American and European institutions. Students will be able to learn from the diverse student body as well as enjoy the cultural opportunities that define southern United States. They will have access to major clinical sites such as the UAB Hospital, Veteran's Administration Medical Center in Birmingham, the Laboratory Corporation of America, and St. Vincent's Medical Center, to name a few.

7.7 Specific Contributions of the Partners from The European Community (EC)

Specific contributions of the European partner institutions are presented below. Participating institutions include the University of Central Lancashire (United Kingdom), University of Wolverhampton (United Kingdom), University of Cadiz (Spain), and Jönköping University (Sweden).

7.7.1 University of Central Lancashire, Faculty of Science

The University of Central Lancashire's (UCLAN) Faculty of Science is comprised of 7 departments and a post-graduate School of Medicine encompassing the Departments of Biological Sciences, Environmental Management, Forensic and Investigative Sciences, Physics, Astronomy and Mathematics, Forestry, Agriculture, and Psychology. The institution is a major educational center within the North West of England offering an extensive portfolio of undergraduate, post-graduate and continuing professional development courses as well as research opportunities. The Faculty of Science will provide an array of clinical and research laboratory training opportunities to students participating in this newly developed international education exchange.

7.7.2 University of Wolverhampton, School of Applied Science

The University of Wolverhampton (UWV) academic staff in the School of Applied Science is dedicated to international exchanges of students and faculty. The Biomedical Science program has had a long-standing reputation for academic excellence and has been the major provider of biomedical scientists for the West Midlands region of the country. The University has been engaged in international student exchanges with the University of Kentucky, College of Health Sciences since 1992 awarding the Bachelor of Science (BSc), Master of Science (MSc), and Doctor of Philosophy (PhD) degrees in this exchange.

7.7.3 University of Cadiz, Program in Biomedical Sciences

The academic staff from the Program in Biomedical Sciences at the University of Cadiz, located in Spain, will provide an area of expertise in order to provide an additional dimension to the normal program of study. Since there has already been a program of international cooperation between this University and the University of Central Lancashire and the University of Puerto Rico, the students from Cadiz will have the opportunity to expand their horizons and get involved in this international program. The institution is committed to the success of this international education exchange program for its students.

7.7.4 Jönköping University, School of Health Sciences

Jönköping University (JPU) College of Health Sciences has recently entered into a new organization as the School joined the University–at-large. The School of Health Sciences joins the Jönköping International Business School, the School of Engineering

and the School of Education and Communication. The School of Health Sciences has rapidly placed itself amongst the leading programs in Sweden involved with international programs dealing with health education. Programs are active within Europe and South Africa. Jönköping University's participation in this new international education program will achieve their goal to establish international links with North America. Students who participate in this program will be far better prepared for future employment in the global marketplace because of these foreign experiences and by their ability to translate the newer molecular techniques and procedures to other students and laboratories where they may be employed in the future.

7.8 Exchange Program Goals

The participating partners agreed to focus on two primary program goals. Firstly, it will promote a student exchange program model for laboratory sciences students and incorporate key recommendations that were expressed by the respondents in this survey research. Secondly, it will provide specific educational, practical and technical experiences for participating students involved in the exchange to learn the similarities and differences of their academic discipline and practice while in residence in the host country. It was decided that the proposed educational experience will emphasize transnational social, political and economic trends in health and health care delivery. Hence, the "added value" is the preparation of laboratorians who are more valued and employable with improved cross-cultural competencies to be fit for service and laboratory practice transnationally.

7.9 Exchange Program Objectives

The objectives of this exchange program are to: promote the exchange of biomedical science/clinical laboratory science students from academic programs affiliated with the Medical Centers of the University of Kentucky, Kansas University, University of Puerto Rico, and University of Alabama. Each have ongoing exchanges or plan to develop exchanges with the European partner institutions (University of Central Lancashire, University of Wolverhampton, University of Cadiz, and Jönköping University); and to enroll participating exchange and home-based students in an online "Comparative Health Care Systems and Health Development" module for academic credit that will ensure that students will comprehend the issues facing healthcare delivery globally that involve countries with different languages and cultures; to enroll participating exchange students in the course(s) in a host country that will be applied to their home institution as course credit. It is possible that participating exchange students could be attracted to other course offerings made available to them by the host institution that is not part of their didactic, clinical and technological training; provide reciprocal clinical experiences for European and American students that is cross-cultural and emphasizes the nature of the healthcare delivery system and practice patterns currently in their respective countries; establish an online web page for all participating exchange students from the various institutions, with an emphasis on developing a "chat room" and "discussion board" to enhance and encourage synchronous and asynchronous communication links between all students; and offer tuition waivers for exchange students so they will not be subjected to any additional tuition costs because these students will basically exchange seats with their international student counterparts.

7.10 Aims of the Exchange Program

In view of the limited number of current international exchange programs (11/104), the small number of students exchanged (186/2604), and the paucity of financial aid, room and board available to exchange students (Figure 4.8) as cited in Chapter 4, the primary program aim is threefold. Firstly, based on the survey findings, increasing exchange opportunities for laboratory sciences students is evident. Secondly, it is important to establish an educational exchange model that contributes an international perspective to the current educational preparation of students enrolled in laboratory science programs among the participating partner institutions, and beyond. Thirdly, noting that 47% of the respondents (49/104) expressed an interest in starting a student exchange program (Table 4.28), this exchange model could be replicated by any of the respondents in the sampled population.

All European and American partners agreed that this exchange program provides a valuable and timely opportunity to educate, improve and expand the technical training of the participating students who will not only be clinically qualified but who will also understand the context of health issues and healthcare delivery as it affects people globally. The participating institutional partners expect that participants of this program will be eligible for employment in government health agencies, health clinics, universities, pharmaceutical companies, and biotechnology firms, across international boundaries. Hence, they will contribute to the emerging global healthcare workforce.

7.11 Student Expectations

During the exchange period, students from participating European and American partner institutions will have the opportunity to experience a variety of academic and cultural activities during their stay in the host country. For example, students will be able to study in the comparable academic program at the host country of their choice, as if they were present at their home institution. They will also experience laboratory practice in the host country and at the same time expand their cultural horizons by participating in an international study and cultural program not currently available to any students in the laboratory profession. In addition, students will have the opportunity to enroll in a unique online course for academic credit on comparative health systems. It is expected that participating exchange students will provide feedback to non-exchange students at their home institution regarding all aspects of the program. In terms of instrumentation, this international program of study will link an academic exchange with advanced information technology and instrument systems in order to expand the workforce opportunities for students in the laboratory sciences. With the advances made in laboratory-based technology and the impact of the human genome project, students will become more confident and competent to compete in the increasing global biomedical marketplace.

7.12 The Proposed Exchange Model

This initiative serves as a model program for training laboratory professionals internationally. The European and American partners do not claim to be able to solve all of issues regarding the credentialing of foreign trained graduates but we do believe that

this innovative education model could become an accepted vehicle by which all qualified domestic and foreign educated and trained clinical laboratory science graduates can be validated in the future. Moreover, the participating partners believe that this education initiative provides a unique opportunity to address a growing concern in the delivery of proper and reliable health care globally and recognize that there has been a limited need to pursue such organized and structured transatlantic education programs. To date, most efforts have been based on individual entrepreneurial endeavours.

7.13 Multilateral Collaboration

The European Community/United States multilateral collaboration will begin to address the problem of isolation as experienced in American allied health science education and the lack of knowledge of the American experience by their European counterparts and vice-versa. The participating partners will therefore design a course/module that will use traditional classroom methods as well as distance education methods using the Internet and World Wide Web. A course/module will be offered by academic staff in multiple countries using available platforms for delivering distance education. Secondly, the partners will focus on those outcomes of this research that suggest that no didactic and clinical practicum experiences currently exist that train mobile laboratory science students for the global workforce of the future. The participating institutional partners will conduct an exchange program in order to provide ample opportunities for students to experience the education and practice of their profession in another country thereby, broadening their experience and making them more flexible and effective laboratory professionals, transnationally. The course/modules

taken in the host institution will provide academic credit and will be registered as part of the students' curricula at their home institution. Thirdly, clinical training sites will be made available for participating students involved in this education and training initiative in order to serve areas that they traditionally are not accustomed, such as the selection of students to serve in medically under-served constituencies as defined as either rural (American) or urban (European) areas and communities. Participating partners will ensure that the host institution provides and arranges a unique set of local experiences that will be designed to complement the academic program such as seminars, grand rounds, visits to local technical and regional clinical facilities, and attendance at professional meetings or conferences taking place in the host country that are suitable and compatible to their specific level of interest and training, to name a few.

7.14 Student Prerequisites

Based on the data collected from this survey related to student assessment and selection criteria (Table 4.12), the exchange program will meet a number of prerequisites including, but not limited to, an excellent academic record, effective communication skills, completion of a year of coursework at their home institution, possess a current active VISA; possess a good command of the English language; be skilled in computer and information technologies, have adequate experience in laboratory practice; and possess adult attributes including maturity and self-sufficiency (Table 4.12).

7.15 Student Preparedness

Linguistic capability was cited by 84.6% of the respondents (88/104) (Table 4.15).

Because of the universal nature of this unique student exchange program, the participating partners expect that all participating exchange students will have reading, writing and verbal comprehension in the English language. Since students from Sweden and Puerto Rico are bilingual (native language plus English) the participating partners do not anticipate any language problems with exchange students such as the students from Puerto Rico studying in Spain. With Spanish being the language of instruction in Spain, participating American students from Alabama, Kansas and Kentucky performing their foreign experience in Spain will be required to demonstrate written, verbal and conversational skills in Spanish language competency. This will be accomplished in the several ways. Students selected for the academic program will have received prior Spanish language instruction to the appropriate level of a general studies Spanish course at the University of Alabama, Kansas University, and the University of Kentucky. Once students are admitted into the exchange program, American students will be given computer software and language tapes for Spanish. Upon arriving at the University of Cadiz, American students will receive an intensive review of Spanish as part of their induction orientation. The participating partners will also investigate the utility of a web-based language course instruction for monitoring Spanish language competency. For Spanish - speaking students coming to the United States, students will be required to demonstrate an appropriate level of written and verbal English skills via the Test of English as a Foreign Language (TOEFL) during the semester preceding their international rotation. Upon arrival at the University of Alabama, Kansas University or the University Kentucky, these students will have the opportunity to enroll in non-credit workshops to improve their English language proficiency.

The partners will also take specific steps to prepare students for the cultural environment of their overseas host country. As part of the support system offered to the foreign students, a "student companion group" will be created. It will consist of volunteer students that will be trained to serve as mentors for the incoming students. Incoming students will be able to meet each other prior to their arrival via telephone calls or electronic mail, making the transition as smooth as possible. The mentor student from the companionship group will: receive incoming student(s) at the airport and escort him or her to their place of residence; help them with the language during their classes and after class time, as needed; help incoming students adapt to the new culture; and support them in other ways as needed. An outcome assessment will be conducted in the form of interviews and questionnaires to be completed by all participants in order to determine the effectiveness of these experiences and the overall success of the program.

7.16 Program Evaluation and Sustainability

As previously stated, I will serve as the education consultant for the previously described transatlantic exchange program. In order to gain valuable information on the success of this proposed program, each cooperating institution will have available for use a questionnaire that will be used to determine the pre- and post- experience in order to best judge the progress of the exchange students who participate in the program. Each of these questionnaires will be prepared after joint consultation between partners. Upon completion of the forms the data will be collected and discussed at annual Advisory Committee meetings. Also, each participating student will be subject to a pre- and post-travel review in order to brief them on the expected experience and outcomes. More

importantly, the post- travel review will be used to debrief the students regarding any problems that the student experienced with the goal to remove or eliminate these problems by the time of the next scheduled visit. The participating partner institutions have engaged in several international exchange programs to date which has generated important information as to the problems and conditions to be experienced; therefore the participating institutions have extensive experience dealing with international students both on their campus as well as within their respective academic programs. Separate evaluations will be solicited at the completion of each course/module. I plan to evaluate all data generated by interviews and questionnaires on an annual basis. These reports will then be evaluated for effectiveness and will be presented to the Advisory Committee on an annual basis.

7.17 The Evaluation Process

Refinement of the total educational experience and formative evaluations will be performed on a continuous basis. Specific evaluation procedures will be based upon the development of the blueprint for the core module/course and will include administrative, student and faculty evaluations. Clearly defined performance measures will be developed to aid the summative and formative evaluation processes. The evaluation process will require participating partner institutions to assist the evaluation consultant in developing appropriate forms and maintaining accurate record keeping of enrollments, program effectiveness, and performance evaluations including, but not limited to, students enrolled in the program; the number of students completing the core course; student performance in the course; exit interviews with exchange and non-exchange students who

completed the course; and exit interviews with those who do not complete the course; number and quality of applicants for student mobility grants; degree to which exchange students meet the program goals and objectives; host faculty evaluations of visiting exchange students; number of students who participate in the exchange program without travel grants; number of "hits" on the Transatlantic Health Sciences Consortium website; exchange students' overall evaluation of their exchange experience, including the participating faculty, course work, clinical practicum, and the like; participating student academic performance and improvement in performance over time; faculty and student evaluations of the core course, including the instructional technologies used to deliver it; and a questionnaire completed by students that will be used to determine the pre- and post- experience in order to best judge the progress of the participating exchange students in the program.

7.18 The Evaluation Plan

Product evaluation will measure the extent to which the goals and objectives of the project have been achieved. The results from the project evaluation will assist the project directors in decisions about maintaining the program as originally designed in this proposal, or to make modifications where indicated throughout the exchange period.

Process evaluation will include observation and the collection of evaluative data once the project is funded and implemented. Records of project activities will be maintained throughout the exchange period and all data collected will be used to identify the project strengths and areas that may need improvement so that changes can be made during the second and third year to improve project effectiveness. Appropriate questionnaires,

checklists, interview forms and other appropriate evaluation techniques will be developed by the evaluator and project directors to measure educational activities, stated project objectives, and analyze the impact of the project on the targeted population. The evaluator and project directors will also be responsible for reporting the results of the evaluations for all project activities. Evaluation methods will follow appropriate procedures as follows: observation, data collection, itinerary, surveys, face-to-face interviews, and small group discussions. Measurement instruments include: interview questionnaires, exchange experience reports, course syllabi and curriculum reviews, survey instrument and web page; Respondents include: exchange student participants, recent graduates, participating faculty and administrators, students enrolled in courses, and participating clinical practicum supervisors.

An annual report will be prepared by the lead partner institutions and a summative evaluation report will be completed by the education consultant. The participating partners will also publish the results of their experience, including the development and implementation process, in scientific journals and present their findings at professional conferences. The concepts developed and tested through this initiative are highly reproducible and adaptable to other disciplines and institutions.

The courses and administrative mechanisms that are designed and used during the exchange period can serve as a model on which to continue to build new coursework and networks of partner institutions in the European Union and the United States aimed at achieving this program's goals. Included in the program planning, each participating partner institution will be planning to secure additional internal and/or external funding to continue the project beyond the initial exchange period.

The American Society for Clinical Pathology (ASCP) and the National Accrediting Association for Clinical Laboratory Sciences (NAACLS), the premier professional certification and accreditation organizations in the United States and their counterpart the Institute of Biomedical Sciences (IBMS) in the United Kingdom, have been requested to assist in the design of a laboratory standard evaluation tool to be used in this project. These credentialing agencies supported this research investigation as a potential viable means to assist them in reducing the critical laboratory workforce shortage that currently exits in the United States and Europe, especially in the United Kingdom.

7.19 Program Sustainability

The proposed student exchange program will be sustained at the outset by internal funding provided by the participating partner institutions and though external funding sources available from both the public and private sectors. Discussions have already taken place between the participating partners and grant and foundation officers at the partner institutions to identify potential sources of funding. Recommendations reported in the Institute of International Education publication "*Financial Resources for International Study*" will be used (O'Sullivan and Steen, 1996). Also recommendations described in the Association for International Educators' publication *"Paying the Bill for International Education"* authored by Alice Chandler will be used (Chandler, 1999).

Institutional funds will be used for the travel, telephone and facsimile communications to coordinate the activities of the Advisory Committee. The most important part of this arrangement is to put agreements into effect that allows for the student exchange without a foreign or out-of-state tuition charge and with full academic

credit recognition. Daily living expenses will be the responsibility of students unless other sources of revenue can be identified.

7.20 Summary

After a careful review of the literature, analysis of the data collected from this survey research, and extensive consultation, great thought and care has been taken to insure that major concerns, perceived barriers, and recommendations for student exchanges cited by respondents and others has been taken into consideration during the developmental stage of this model exchange program. Once implemented and evaluated, I believe that this exchange program has great potential for success. I truly hope that someday this unique project will serve as a model training program for biomedical/clinical laboratory scientists who wish to participate in an exchange program and perhaps even qualify for international professional certification in order to work outside their country of origin.

Should the credentialing agencies from all of the participating member countries agree on international standards for biomedical/clinical laboratory scientists, then international professional certification may be feasible in the not- too- distant future. Further research is needed in terms of international professional certification and mutual credentialing for the laboratory profession. From the first stage of this research until the present, I spear headed dialogue on these topics among and between leaders of the international laboratory community. I shall pursue further research on these important topics in conjunction with the Transatlantic Health Science Consortium, the ASCP Board of Registry Globalization Task Force and the International Federation of Biomedical

Laboratory Science (IFBLS) Expert Educators Group in Biomedical Science, of which I am an active member.

On a final note, several colleagues have told me that my dreams of international professional certification and mutual credentialing for laboratory professionals are impractical, revolutionary, and unrealistic. At times like this, I am reminded of the inspirational message of an unknown author who said "dreams are not impractical. They are the blueprints of the future. Nothing happens without a dream. All the great people in the world have dreamed great dreams." Why shouldn't I?

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List of Published Abstracts from Conference Presentations

Conference:	International Association of Medical Laboratory Technologists World Congress, 30 July 2002, Orlando, FL USA
Presentation Title:	Think Global-Act Global: Internationalizing a Clinical Laboratory Science Curriculum
Conference:	Consortium of Institutes of Higher Education in Health and Rehabilitation in Europe Annual Conference, 26 February 2003, Maastricht/Heerlen, the Netherlands
Presentation Title:	International Cooperation within Biomedical/Clinical Laboratory Sciences
Conference:	American Society for Clinical Laboratory Science Annual Meeting, 20 July 2003, Philadelphia, PA
Presentation Title:	Global Clinical Laboratory Science Education: A Transatlantic View
Conference:	Institute of Biomedical Science Congress, Birmingham, UK, 29 September 2003
Presentation Title:	Transatlantic Cooperation in Biomedical Science Education
Conference:	Association for Schools of Allied Health Professions, 24 October 2003, Toronto, Canada
Presentation Title:	Transnational Professional Credentialing for Laboratory Sciences?: New Horizons
Conference:	ElearnChina Conference, 23 July 2003, Edinburgh, UK
Presentation Title:	Putting the E Into Transnational Education
Conference:	International Federation of Biomedical Laboratory Science 26th World Congress, 13 June 2004, Stockholm, SE
Presentations:	Supporting International Certification for Clinical/Biomedical Laboratory Scientists
	Globalizing Laboratory Personnel: Quality Assessment and Management Mechanisms

APPENDICES

Appendix	
A	Final approved survey questionnaire
B	Electronic version of cover letter and survey Questionnaire

Survey of Clinical Laboratory Science/Medical Technologist Program Directors & Biomedical Science Liaison Officers

Directions:
Please complete the information requested by filling in the blank spaces; place the letter "Y" for yes and "N" for No where indicated; and enter "X" underneath the number of your choice.

VERIFICATION

Name: Position/Title:
Institution: Country:
Type(s) of Program:
CLS/MT: Number of students:
BSc (Hons): Number of students:

This information is for verification purposes only. No names or institutions will be identified in the presentation of findings.

EXISTING PROGRAM INFORMATION

1. Does your program have an international exchange program?
   a) Yes (Y):
   b) No: (N): **If you answered no to this question, skip to question # 6.**

2. Please provide the following information about your international exchange program (s):
   a) Name of host institution(s):

   b) Name of host country/countries:
   c) Overall number of students exchanged:
   d) Overall number of faculty exchanged:
   e) Average length of exchange period (in months):

3. Do you provide financial aid for either incoming or outbound students?
   a) Yes (Y):
   If yes, please specify type of aid
   b) No (N):

The following questions ask about your institution and your international host partner

4. Does your program provide room and board? Y=yes; N=No
   a) Room:
   If yes, specify (e.g. campus housing, private home, hotel):
   b) Board:
   If yes, specify (e.g. meal ticket, stipend):

5. Does your international host partner/s provide financial aid, room, and board for either incoming or outbound students? Y=yes; N= No
   a) Financial Aid:
   If yes, specify type of aid (e.g. travel grant, scholarship):
   b) Room:
   If yes, specify (e.g. campus housing, private home, hotel):
   c) Board:
   If yes, specify (e.g. meal ticket, stipend):

TRANSATLANTIC EXCHANGE

In the U.S., students in a Clinical Laboratory Science/Medical Technology Program attend university to receive a Bachelor of Science (BS) degree and do a clinical laboratory placement in order to take a national certification examination. In the UK, students in a Biomedical Science Program attend university to receive a "BSc" degree in Biomedical Science. To obtain "state registration" they then must do a clinical placement to generate their "log book" that is validated by the Institute of Biomedical Sciences for attendance and competency.

For each of the items listed below, please place an X in the column that best represents your opinion and rate in order of importance.

RANKINGS: 1=very important
2=fairly important
3=neutral
4=somewhat not important
5=not important

6. If a transatlantic exchange program between clinical laboratory sciences/medical technology students and biomedical science students was developed, please rate each of the possible program components.

		Very Important				Not Important
	Component	1	2	3	4	5
A	An on-line comparative health systems course					
B	A laboratory course in one subject (e.g. Clinical Hematology)					
C	Bench training in a single rotation at a clinical laboratory					
D	Bench training in multiple rotations at a clinical laboratory					
E	A research project					
F	Other (specify & rate):					

7. What criteria should be considered in the assessment and selection of qualified candidates for a transatlantic exchange? Please rate each criterion.

		Very Important				Not Important
	Criteria	1	2	3	4	5
A	Excellent academic record					
B	Prior overseas experience					
C	Effective communication skills					
D	Completion of at least 1 year of coursework at home institution					
E	Enrolled in a training component of program at home institution					
F	Other (specify & rate):					

8. What factors do you believe are important to conducting a successful transatlantic student exchange program? Please rate each factor. Very Important Not Important

	Factors	1	2	3	4	5
A	Institutional resources (housing, labs, faculty)					
B	Clinical training sites resources (lab facilities, clinical instructors)					
C	Administrative support and involvement					
D	Tuition fee waiver policy for exchange students					
E	An International student services office					
F	Other (specify & rate):					

9. What basic skills do you think students need for optimum performance in a transatlantic exchange program? Please rate each skill. Very Important Not Important

	Basic Skills	1	2	3	4	5
A	Technical					
B	Information Technology					
C	Management and leadership					
D	Critical Thinking					
E	Linguistic capability					
F	Other (specify and rate):					

10. Below is a list of potential barriers preventing higher education institutions from participating in student exchange programs. Please rate each barrier. Very Important Not Important

	Institutional Barriers	1	2	3	4	5
A	Lack of information					
B	Lack of institutional resources (financial, human)					
C	Lack of faculty commitment					
D	Lack of administrators commitment					
E	Tuition and residency policies					
F	Other (specify and rate:					

11. Below is a list of barriers preventing students from participating in exchange programs. Please rate each barrier. Very Important Not Important

	Student Barriers	1	2	3	4	5
A	Lack of information					
B	Language requirements					
C	Lack of financial resources					
D	Credit recognition policies					
E	Visa/immigration requirements					
F	Other (specify & rate):					

INTERNATIONAL PROFESSIONAL CERTIFICATION

12. Do you think an international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists?

a) Yes and Why? Be specific:

b) No and why not? Be specific:

13. What qualifications do you think clinical laboratory scientists/medical technologists/biomedical scientists should meet in order to be eligible for international professional certification?

Place the letter "X" in the box provided below

	Qualifications	Yes	No
A	Pass respective certification/registration exam plus 3 years of work experience		
B	Pass respective certification/registration exam plus 2 years work experience		
C	Only pass their respective national certification/state registration exam		
D	Other (please specify):		

14. Do you think that the laboratory credentialing agencies in the US and the UK should consider mutual credentialing for graduates of their respective accredited clinical laboratory sciences/medical technology/biomedical science programs?

Enter letter here:

Enter Y for yes or N for No ☐

15. a) If yes, how do you see this being accomplished?

b) If no, please state your reasons against.

16. Would you be interested in starting an international exchange program at your institution?

a) Yes (Y):
If yes, specify target institutional partner/s and country/countries.

b) No (N):
If not, why not?

17. For other comments or suggestions, please specify below:

Thank you in advance for your prompt responses.
Your feedback is greatly appreciated.

Please return to: Ellen Hope Kearns ***lancashirestudy@earthlink.net***

List of Corrections

Page	Location	Corrections
5	para ; line	changed "qualify" to "quality"
54	para : line	changed "based my research goals" to "based on my research goals"
62	para ;line	deleted "please rate each of the possible components"
78	para ;line	restated from "the working in which they work" to "the setting in which they work"
88	para ;line	Figure 4.7. Removed blue box 16-30
89	para ;line	corrected the spelling from Cypress to Cyprus
136	para ; line	deleted "While"
160	para ;line	changed "preciously" to "previously"
212	Denzin reference	changed "London: Sage Publications, Inc." to "Sage Pulications, Inc., London, UK"
217	Goldsmith ref.	deleted "Goldsmith, S., 2004. A global certification program:implications of the ASCP Board of Registry. Personal Report
218	Hope ref.	changed "pp. 103-4" to "pp. 103-104"
220	Kimball ref.	changed "114(1);45" to "114(1),45."
221	Leedy ref.	changed "fifth Edition" to (5th ed.)"

October 23 2002

Dear Colleague,

I am a doctoral student at the University of Central Lancashire in the United Kingdom (U.K.) conducting a research study entitled. "A Model for International Clinical/Biomedical Science Programs". The purpose of the research is to develop a model for an international program of study for clinical laboratory scientists/medical technologists in the United States and biomedical laboratory scientists in the U.K. and affiliated accredited sites. With international programs of cooperation in place, it may then be possible to have increased numbers of quality trained laboratory personnel available to address the acute labor shortage that exists in both countries. My primary research goals are: to evaluate the extent to which CLS/MT programs in the U.S. and Biomedical Science programs in the U.K. and affiliated sites participate in international student/faculty exchanges; to identify potential student and institutional barriers regarding student exchanges; and to examine the extent to which program directors are interested in international student exchanges and international professional certification. The study is important because:

* The U.S. Bureau of Labor Statistics has reported that there are projected to be over 6,000 vacancies per year from 2002 through 2010 in the U.S. American based educational programs are projected to produce only half the number of graduates this year compared to what is needed, thus creating a growing healthcare crisis in the U.S.
* In the U.K., the findings of a recent recruitment survey by The Institute of Biomedical Science revealed that 88% of all laboratories within National Health Service (NHS) hospitals consider themselves below strength in staff numbers
* For health science students there have been very limited opportunities for mobility across national boundaries
* Establishment of international CLS/MT/BLS programs could improve student enrollments in these programs because they would provide opportunities for students to study abroad in an academic course of study that heretofore has not been the focus of international development.

As a director of a clinical laboratory/biomedical science/medical technology/ program, I am requesting your professional opinion and experience regarding the opportunities for international exchange programs and international professional certification for clinical laboratory scientists/medical technologists (CLS/MT) and biomedical laboratory scientists (BLS). Your participation in this survey is important. It will contribute to producing an expert consensus regarding the future direction of transnational training and education programs. How the information will be used is as follows: the findings of this research study will be used to foster transatlantic study and workforce opportunities for CLS/MT/B LS students. Also, it will provide information about educational accreditation and certification barriers that currently exist because of lack of a uniform curriculum for academic programs. It can also provide data demonstrating the need and interest for international partners to work together. Therefore, your participation in completing this survey by providing your thoughts and opinions about international credentialing programs and the future direction of

CLS/MT/BLS will allow us to further develop the globalization of these programs and their certification.

This survey is endorsed by both the American Society for Clinical Pathology, Board of Registry (ASCP-BOR) and the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) in the U.S. The survey should take less than 20 minutes to complete. All responses will be kept confidential. In the presentation of findings, no individual or institution will be identified. Please note that completing and returning the survey questionnaire constitutes your informed consent to participate in this project. Should you have any questions regarding your participation in this survey, please contact me by email at lancashirestudy@earthlink.net, or by telephone at +1-310-243-3364 in the U.S. or write to Ellen Hope Kearns, M.S., SH(ASCP)H, 7092 Betty Drive, Huntington Beach, CA 92647 USA.

Thank you for your participation. A response is appreciated via email no later than December 29, 2002. The results of this survey will be made available, upon request, to all respondents.

Sincerely,
Ellen Hope Kearns, M.S., SH(ASCP)H

Survey of Clinical Laboratory Science/Medical Technologist

Program Directors & Biomedical Science Liaison Officers

Directions:

Hit the reply button on your email program.

Please complete the information requested by filling in the blank spaces;
place the letter "Y" for yes and "N" for No where indicated; and enter "X" underneath the number of your choice.

VERIFICATION

Name:
Position/Title:

Institution:

Type(s) of Program:

CLS/MT: Number of students:

BSc (Hons): Number of students:

This information is for verification purposes only. No names or institutions will be identified in the presentation of findings.

EXISTING PROGRAM INFORMATION

1. Does your program have an international exchange program?

a) Yes (Y):

b) No: (N):

If you answered no to this question, skip to question # 6.

2. Please provide the following information about your international exchange program(s):

a) Name of host institution(s):

b) Name of host country/countries:

c) Overall number of students exchanged:

d) Overall number of faculty exchanged:

e) Average length of exchange period (in months):

3. Do you provide financial aid for either incoming or outbound students?

a) Yes (Y):
If yes, please specify type of aid :

b) No (N):

The following questions ask about your institution and your international host partner

4. Does your program provide room and board? Y=yes; N=No

a) Room:

If yes, specify (e.g. campus housing, private home, hotel):

b) Board:
If yes, specify (e.g. meal ticket, stipend):

5. Does your international host partner/s provide financial aid, room, and board for either incoming or outbound students? Y=yes; N= No

a) Financial Aid:

If yes, specify type of aid (e.g. travel grant, scholarship):

b) Room:

If yes, specify (e.g. campus housing, private home, hotel):

c) Board:

If yes, specify (e.g. meal ticket, stipend):

TRANSATLANTIC EXCHANGE

In the U.S., students in a Clinical Laboratory Science/Medical Technology Program attend university to receive a Bachelor of Science (BS) degree and do a clinical laboratory placement in order to take a national certification examination. In the UK, students in a Biomedical Science Program attend university to receive a "BSc" degree in Biomedical Science. To obtain "state registration" they then must do a clinical placement to generate their "log book" that is validated by the Institute of Biomedical Sciences for attendance and competency.

For each of the items listed below, please place an X in the column that best represents your opinion and rate in order of importance.

RANKINGS: 1=very important; 2=fairly important; 3=neutral 4=somewhat not important; 5=not important

6. If a transatlantic exchange program between clinical laboratory sciences/medical technology students and

biomedical science students was developed, please rate each of the possible program components.

a) An on-line comparative health systems course

b) A laboratory course in one subject (e.g. Clinical Hematology)

c) Bench training in a single rotation at a clinical laboratory

d) Bench training in multiple rotations at a clinical laboratory

e) A research project

f) Other (specify & rate):

RANKINGS: 1=very important; 2=fairly important; 3=neutral 4=somewhat not important; 5=not important

7. What criteria should be considered in the assessment and selection of qualified candidates for a transatlantic exchange? Please rate each criterion.

a) Excellent academic record

b) Prior overseas experience

c) Effective communication skills

d) Completion of at least 1 year of coursework at home institution

e) Enrolled in a training component of program at home institution

f) Other (specify & rate):

RANKINGS: 1=very important; 2=fairly important; 3=neutral 4=somewhat not important; 5=not important

8. What factors do you believe are important to conducting a successful transatlantic student exchange program?

a) Institutional resources (housing, labs, faculty)

b) Clinical training sites resources (lab facilities, clinical instructors)

c) Administrative support and involvement

d) Tuition fee waiver policy for exchange students

e) An International student services office

f) Other (specify & rate):

RANKINGS: 1=very important; 2=fairly important; 3=neutral 4=somewhat not important; 5=not important

9. What basic skills do you think students need for optimum performance in a transatlantic exchange program?

a) Technical

b) Information Technology

c) Management and leadership

d) Critical Thinking

e) Linguistic capability

f) Other (specify and rate):

RANKINGS: 1=very important; 2=fairly important; 3=neutral
4=somewhat not important; 5=not important

10. Below is a list of potential barriers preventing higher education institutions from participating in student exchange programs.

a) Lack of information

b) Lack of institutional resources (financial, human)

c) Lack of faculty commitment

d) Lack of administrators commitment

e) Tuition and residency policies

f) Other (specify and rate: adequate student funding

RANKINGS: 1=very important; 2=fairly important; 3=neutral
4=somewhat not important; 5=not important

11. Below is a list of barriers preventing students from participating in exchange programs.

a) Lack of information

b) Language requirements

c) Lack of financial resources

d) Credit recognition policies

e) Visa/immigration requirements

f) Other (specify & rate):

RANKINGS: 1=very important; 2=fairly important; 3=neutral
4=somewhat not important; 5=not important

INTERNATIONAL PROFESSIONAL CERTIFICATION

12. Do you think an international professional certification should be available to clinical laboratory scientists/medical technologists and biomedical scientists?

a) Yes and Why? Be specific:

b) No and why not? Be specific:

13. What qualifications do you think clinical laboratory scientists/medical technologists/biomedical scientists should meet in order to be eligible for international professional certification?

a) Pass respective certification/registration exam plus 3 years of work
experience

Yes :

No:

b) Pass respective certification/registration exam plus 2 years work
experience

Yes :

No:

c) Only pass their respective national certification/state registration exam

Yes :

No:

d) Other (please specify):

14. Do you think that the laboratory credentialing agencies in the US and the UK should consider mutual credentialing for graduates of their respective accredited clinical laboratory sciences/medical technology/biomedical science programs?

Enter letter here:
Enter Y for yes or N for No

15. a) If yes, how do you see this being accomplished?

b) If no, please state your reasons against.

16. Would you be interested in starting an international exchange program at your institution?

a) Yes (Y): Y

If yes, specify target institutional partner/s and country/countries.

b) No (N):

If not, why not?

17. For other comments or suggestions, please specify below:

FOR DEMOGRAPHIC PURPOSES ONLY:
Please place an "X" next to the appropriate response.

US Geographic Region
NORTH EAST (ME, VT, NH ,NY, MA, RI, CT, PA, NJ; DE, MD, WV, VA):
NORTHWEST (AK, WA, OR, ID, MT, WY):
MIDWEST (ND, MN, WI, MI, SD, NE, IA, IL, IN, OH, KS, MO, KY):

SOUTHWEST (CA, NV, UT, AZ, CO, NM, HI):
SOUTHEAST (TX,OK,AR,TN,NC, SC,LA,MS,AL,GA,FL):
US COMMONWEALTH (PR):

EC Geographic Region
UK (England, Scotland, Wales, Northern Ireland):
SRI (Sri Lanka):
MT (Malta):
MY (Malaysia):
IE (Ireland):
HK (Hong Kong):
AU (Australia):

WORK SETTING
Hospital/Health System:
Academic Health Center:
Reference Laboratory:
College/University/Medical Center:
Veteran's Affairs Hospital:
Other (please specify):

GENDER
Male:
Female:

JOB TITLE/POSITION
CLS/MT Program Director:
BSc(Hons) Liaison Officer:
Clinical Instructor:
Education Coordinator:
Other (please specify):

ACADEMIC DEGREE
Baccalaureate degree (BA, BS):
Master's degree (MS, MBA,
MPH,MHS,MPA,MEd,MHDL,MA,MCC,MHA,MHSA,MHSM):
Doctorate (PhD, EdD,MD,DA):

CREDENTIALS
Generalist:MT(ASCP), CLS(NCA):

Specialist:SH(ASCP)/CLSp(H);SC(ASCP)/CC(NRCC);SBB(ASCP);S
M(ASCP)/I(ASCP):
Diplomate: CLD(NCA); DLM(ASCP):
CHES:
Other (please specify):

STUDENT ENROLLMENT IN YOUR CLS/MT/BLS PROGRAM
0-5:
6-10:
11-15:
16-20:
>20:

Thank you in advance for your prompt responses.
Your feedback is greatly appreciated.

Please return to:
Ellen Hope Kearns
lancashirestudy@earthlink.net