COMP 7036 Research Proposal
Hands-On Versus Simulation Training

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December 13, 2011

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1 Abstract

The debate between advocates of in-class education and advocates of remote education have been conflicting for years now; much like the one between hands-on and simulation laboratories. Each claim that their methodology provides better utility for both the student and the educator (whether the individual instructor or the institute). The Information Technology field of work is one that can be debated whether the costs of a classroom environment and the time spent outweigh the benefits from this traditional method.

This proposal seeks to study compare the two educational environments and provide a definitive answer for students of the field. This study would not only give students the best chance to find a job or a career, but it would also provide better workers for the industry. The first part of this process will be to look up employment rates from educational institutes. The second will be to contact IT companies or businesses for interviews. This data will show how the current batch of IT professionals learned their skills. This research could be taken further to study the cost-effectiveness of each methodology for both the educator and the industry.

2 Introduction

There has always been an unsettling debate between the advocates of in-class education and the advocates of remote education. This is similar to the debate between the advocates of hands-on versus the advocates of simulation education [**?**]. The in-class advocates claim that it is important to learn and work in a social environment with instructor and peers in-person to guide you. This will also lead to improved teamwork ability and social communications. On the other side, the remote advocates claim that technology has advanced enough that an in-class environment is not necessary any longer. An IT-based work can be done on-line from home or even a local coffee shop these days, which questions the relevance of the classroom.

Traditional methods have proven that they have worked over the centuries and has continued to work today. The classroom environment provides a social atmosphere where students and instructors can learn, help and communicate in-person. This allow students to get immediate help on problems from peers and work out any confusion as it is easier to communicate verbally rather then in text. The students will also learn how to communicate with each other and experience a cooperative work environment; teamwork is a key component to many jobs in the market. The argument against in-class (like hands-on) is that they "put a high demand on space, instructor time, and [workstations]" [**?**]. This demand is reduced in the convenience of a remote environment.

Since most or all the work is or can be done on a computer, people will be using their own machines at home with Internet. Any assignments and work can be done remotely and delivered through email or virtual drop-in service. A simulated environment can also be set up remotely and allow students to test their applications. With all these advancements in technology and the speed at which we can communicate, advocates believe that it is the future of education.

This study will be looking into this matter within the Information Technology (IT) field of work. The question that this study will attempt to conclude is "Which type of employee or student education environment, in-class or remote, provides more success within the Information Technology industry?"

3 Problem and Setting

3.1 Problems

3.1.1 Main Problem

Which type of employee or student education environment, in-class or remote, provides more success within the Information Technology industry?

3.1.2 Subproblem 1

What is the success rate of finding and remaining in a job through in-class education compared to the remote version?

3.1.3 Subproblem 2

Are there any particular jobs that primarily have students from in-class compared to remote and vise-versa?

3.1.4 Subproblem 3

Are there any significant differences between males and females for each type of education environment?

3.2 Hypotheses

Employees and students who learn from an in-class environment gain better cooperative and social experience that will help in the job search and job stability. IT professionals who learn from a remote environment obtain better skills for working on individual projects. The in-class students would likely be more employable because of their teamwork skills and sociability and would also allow them to remain in the job longer.

3.3 Delimitations

This study is only researching the debate between in-class and remote environments in the IT field. It will not attempt to generalize the conclusion to all other fields of work as there are many different variables within the other fields. The data will only be gathered from the IT-related jobs from the employments statistics from institutes. Similarly, all companies and businesses that are interviewed will be related to IT.

The study will not look into how cost-effective each educational environment but rather which method allows the individual to succeed more than the other. This is the "maximax" approach to finding success in an IT career. However, the study can be used in future research regarding this matter to further help the students and institution on selecting the best environment for learning in a IT-based field.

3.4 Definitions

This section will define several terms that are used in the research proposal. This will clarify any misconceptions or confusions for any of the terms to be used.

Benefits	Knowledge and skills gained through the training method.
Cooperative Experience	Ability to work projects in a team environment.
Cost-Effective	The benefits of the choice outweigh the costs of it.
Environment	Atmosphere and culture of the training or workplace.
Didactic	Teaching approach.
In-class Training	Learning and improving skills in a classroom environment.

Influence	Change the student's or employee's way of thinking.
IT	Information Technology
Limitations	Knowledge or skills that the training method fails to teach.
Maximax	To maximize the maximum end result.
Remote Training	Learning and improving skills through on-line services
Social Experience	Ability to communicate with peers effectively.
Stability	Good job security in their current jobs and/or careers.
Success Rate	Percentage of IT professionals with successful careers.

Note: Environment and method are used interchangeably throughout the proposal.

3.5 Assumptions

- Everyone training or learning to become an IT professional has access to the Internet and understands how to use it.
- Students in the in-class environment had purely in-class course programs.
- Students in the remote environment had purely remote course programs.

3.6 Importance of Study

This study is important because it will help define education programs in the future. Choosing the proper training program will ensure that the employees or students entering the IT industry will have necessary skills for the job. It will aid companies and educational institutes when making decisions on how to implement their education programs.

4 Literature Review

While there are many papers promoting, debating, or comparing hands-on (in-class) and remote education environments, there does not seem to be any that refer to the end result; obtaining a job and/or a career. The papers usually compare the benefits and limitations of the two methodologies (three if simulation is counted as a separate methodology). In this review, we will look into researches that debate different components of each methodology for the application of general education as well as possible designs for remote environments that would trump in-class ones.

Marc-Alain Steinenmann and Torsten Braun [**?**] studied the differences between remote and tradition learning when it comes to networking courses. They looked at both the didactics and the technical differences. With the Internet as efficient as it is, educational institutions feel the pressure for offering on-line (remote) courses. They claim that the on-line courses designers are not designing proper formats for remote education to be as effective as it should be. They conclude in the study that on-line courses (at their current state) are a good supplementary but further research is required to claim it as prevalent.

Although their study had a rather small sample size of 12, the participants seem to agree that the social aspect of the traditional classroom environment is necessary. The classroom atmosphere creates motivation for studying as we have associated the two since we were little. People also have the tendency to trailing off their study and work when there is let restrictions on them.

In 2006, Jing Ma and Jeffrey V. Nickerson [**?**] wrote a literature review on articles related to hands-on, simulated, and remote laboratories. Most of the articles they found were about engineering. Like IT, many other fields of work are debating the effectiveness of remote education. They conclude that remote education is increase mostly due to technological advancements and the costs of tradition in-class education. As stated by Steinenmann and Braun [**?**], the pressures lead to on-line courses that are not effective.

Following their review, in 2007, Ma and Nickerson along with several other researchers began the study [**?**]. Like their literature review, the study is based on science and engineering education; but the remote and in-class element can also

be applied. Their results show that remote labs are as capable as in-class labs when teaching concepts. They suggest that the social element can also be keep while using the remote format. The potential for remote education is there, and with the technology as it is, it seems likely to be main stream in the coming years.

Nathaniel Gephart and Benjamin A. Kuperman [**?**] on the other hand believe that network security courses need in-class activity. They claim that in-class education not only helps students understand the concepts better but also the memorization of them as well. However, the costs of labs dedicated to IT courses, especially network security, is high. Therefore, they believe that a proper virtual classroom must be designed to settle the matter, but it will take some time.

Steven Rigby and Melissa Dark [**?**] explore a design to make remote education cost-effective with a hands-on feel to the labs. On-line course design is complex (much like in-class course designs) but requires a different approach as it uses a different medium. The key is to design a flexible, scalable, and interactive program that teaches the students all the necessary concepts. Their design looks promising but will require further testing to prove its effectiveness.

Kuang-Chao Yu and Kuen-Yi Lin [**?**] discuss the possibility of implementing a combination of remote and in-class programs within a course. The general summary of their design is to have all the concepts and a simulation on-line and the. Of course, this exact design may not be particularly suitable for most IT-based courses, the combination of the two methodologies can a solution to minimize the cost as well as provide a social aspect.

The general consensus between the papers is that remote learning is starting to gain ground in the education system. The advancement in technology allows remote education to be possible, due to the ever-growing sophistication of virtual (simulated) environments and the incredible of speed of communication. Many believe that it may be the future of education; however it does lack some of the key features of in-class education. This is the reason that in-class education has yet to fade.

Although there has been many studies and debates about in-class and remote programs on education for the individuals' skills, there does not seem to be any studies related to the job search. The studies usually compare the effectiveness of the methods the "overall academic ability (measured by GPA)" [**?**]; however, GPA does not directly translate into a great employee in the industry. It is important that the students have the necessary skills to be able to perform the work required and both methods do provide the skills for the field. This study will take a look into the employment side of education instead.

5 Research Methodology

The study will require two sets of data, one from collected previously by education institutions and the second from a longitudinal study afterwards.

The first data set will comprise of employment statistics that were gathered by the institutions over the years. Alumni students are usually surveyed about their current employment situation as well as suggestions for improvements to the program. This allows the institutions to improve their courses and show off there programs to future potential students. This data will provide the most current (within the last few years) statistics for each educational environment.

The second set of data will come from a longitudinal study, where several institutions set up a programs in which

The reason why there are two data sets is because remote education has only begun to increase while there has be data for in-class for years; therefore, the data may be skewed towards the in-class environment. By performing a longitudinal study with more control, we can compare the two on a more equal level.

5.1 Data Treatment

5.1.1 Subproblem 1

The data will suggest which

5.1.2 Subproblem 2

The data will be categorized in department groups such as software development, web development, and networking. Then the groups from the in-class data will be compared with the groups to see if an environment produces more specialists in a particular field. This may show us, which environment to pick if we are targeting a job. However, there may be a chance that students aiming for a specific job may tend to pick a specific methodology.

5.1.3 Subproblem 3

This subproblem looks at the significance of educational environment for each of the genders. Therefore, the data will be split into four categories: Male In-Class, Male Remote, Female In-Class, and Female Remote. The next step would be to compare the categories for any significant differences in the percentages. Thus, it can be seen (with the data at hand) if there is correlation between genders and success due to a specific educational environment.

6 Researcher Qualifications

I am student in the Bachelor degree program at British Columbia Institute of Technology. My field of expertise is under network administration with both theory and programming. I am currently enrolled in a course for Applied Research Methods in Software Development in which the research proposal initiated. I have also been involved in a project for marketing research in which our team performed quantitative research methods.

7 Outline of Proposed Study

This section will provide an overview of the steps that will be taken for the proposed study. It will also include an estimated timeline for each step and when the research is complete.

7.1 Steps for Conducting the Research

1. Develop a list of benefits and limitations for current in-class environment.
2. Develop a list of benefits and limitations for current remote environment.
3. Get viable institutions from the list of educational institutions (see Appendix).
4. Collect employee statistics from institutions from the viable list.
5. Analyse the statistics from institutions
6. Summarize the current data set.
7. Decide whether there is any conclusive results (Redo steps 3-6 if not conclusive).
8. Negotiate longitudinal studies with potential institutions.
9. Collect data from the institutions over the next few years.
10. Summarize the data set.
11. Report on the findings.

7.2 Estimated Timeline for the Research

Step #	Estimated Time	Step #	Estimated Time
1	Half-Month	7	Quarter-Month
2	Half-Month	8	6 Months
3	Half-Month	9	4 Years
4	3 Months	10	1 Month
5	3 Months	11	3 Months
6	Quarter-Month		

Note: See Appendix B for a visual look at the timeline.

8 References

9 Appendices

9.1 A - List of Possible Educational Institutions

Canadian Institutions
Acadia University
Brandon University
British Columbia Institute of Technology
Capilano University
Ecole Polytechnique
Kwantlen Polytechnic University
Memorial University of Newfoundland
Saint Thomas University
Saint Mary's University
Simon Fraser University
Thompson Rivers University
Universit de Montral
Universit du Qubec
University of Alberta
University of British Columbia
University of King's College
University of Lethbridge
University of Manitoba
University of New Brunswick, Fredericton and Saint John
University of Northern British Columbia
University of Ontario Institute of Technology
University of Ottawa
University of Prince Edward Island
University of Saskatchewan
University of the Fraser Valley
University of Toronto
University of Waterloo
University of Western Ontario
University of Windsor
University of Winnipeg
University of Victoria
York University

American Institutions
California Institute of Technology
Massachusetts Institute of Technology
Harvard University
Penn State University
Stanford University
University of California, Berkeley
University of Michigan
University of Minnesota
University of Texas at Austin
University of Virginia
University of Wisconsin-Madison

Note: There are more possible educational institutions that can be used for data collection.

9.2 B - Gantt Chart for Estimated Timeline

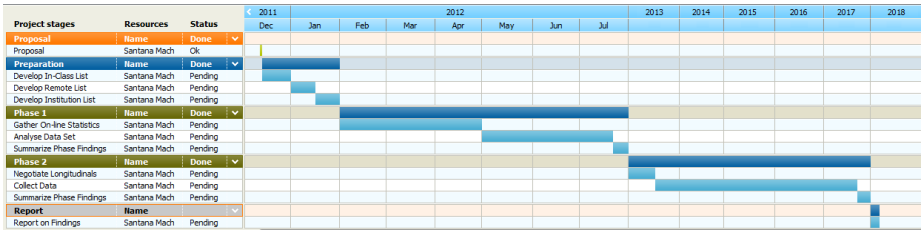

Figure 1: Research Schedule