

Human-computer interaction and its relation to Educational Systems

Research Proposal

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I. Introduction

General background for the study

As the computing industry expands, education is increasingly correlated with computer usage; however, it is unclear what methods are most effective at delivering education to those utilizing computers as their primary learning tool. In this study, we will find methods in which the human-computer interaction experience can be improved to deliver a stronger and richer learning experience in the context of online or long distance education.

Users expect effective high-quality educational and training material, but they also expect smooth integration of this material and training; in this case, with advanced computational and networking frameworks featuring effective workflow and potential to allow a user's education to flourish.

The current systems in place tend to push too much information to the user at once, be confusing to navigate, and cause discontentment more often than not. Navigation is a huge issue for users as it can often be more frustrating to use these systems rather than use alternative or obsolete systems like physically handing in copies or visiting an institution.

Previous studies concerning the topic of human-computer interfaces and educational systems by Zhang, Zhan and Du in 2010 found that there is a link between the user interaction and the cognitive processes that occur. Their theories will be integrated in the interviewing process, and their solutions will be taken into consideration upon drawing conclusions for this study.

Yet the future seems to be pushing us progressively towards using these systems, such as Desire2Learn, a Learning Management System that is utilized all over the world. These systems have certainly have come a long way in the previous years, since the days of Web Lecture System and NovaNet, but there will always be room for improvement.

Terms and Definitions

Throughout the paper, the terms "System" or "Educational System" will refer to the pre-established distanced learning systems that allow a student or instructor within an institution to access and gather lecture materials, assignments, quizzes, surveys, examinations, as well as view their progress and communicate with each other.

Human-Computer Interaction refers to how the user will interface with the systems in place; most frequently through the Internet on a computer or mobile device. Additionally, this study

often refers to the Human-Computer interaction in how the user views, uses, and navigates these systems.

The user, student, and instructor refer to the person or persons accessing the system, whereas the institution refers to whoever is implementing the system in place.

Purpose of the study

The purpose of this study is to find an efficient and effective way to deliver education through modifying or updating computer-assisted methods. Human-computer interaction, user interfaces, and the majority of systems in place that try to deliver education in method of the Internet all tend to have a slew of problems ranging from quality of service to inadequate materials, including the inability to deliver and receive proper feedback. The study aims to find a design and work towards improvements for earlier designs to allow a system to be entirely more effective and appealing to the users, of which is both enticing for a student to use and easy for an institution to implement. Alternatively, these findings will be generalizable to work towards new systems that incorporate the summary of the study.

Guiding questions

A primary question posed is how do we design a system or tool that will offer the most effective and easy experience and allow the most amount of information to be portrayed in a consistent, organized manner. A secondary key question is how human-computer interactions can be tweaked to enhance the user interface and experience when it comes to electronic educational systems.

The questions we aim to inquire on include how users currently feel about their experiences with computer interfaces in relation to their educations and what they feel is either lacking or had excelled in these experiences. Furthermore, we will inquire on how users feel improvements could be made as well as find which elements of the tools are deemed most important and if those correlate with what an instructor or institution would deem important.

Eventually, there is achieved information that will allow us to come to conclusions that can be used to create or modify how accessing education on the computer as an experience is for the user.

Delimitations and limitations

This study's scope will be limited to the educational systems and their interfaces and human-computer interactions and how to improve them. The main answers we seek are how to arrange

a user interface, deliver content, and allow easier student-instructor interaction. The study is strictly on how a user interacts and feels about the systems, and results will be pulled from these. We will not look into the backend programming, the protocols or security of these systems and tools, as it would not be feasible to have both the front-end and back-end within the same research. Additionally, the study will not look at what the information pushed onto these systems, but instead how the information is pushed and interacted with on a deeper level.

The study will only apply to educational systems; however, it will not apply to a specific one within that genre. As the study aims to gather information from a representative sample of students who use these systems, the information gained can be generalized to all students who utilize similar systems.

Significance of the study

Ultimately the goal of improving design and finding new ways and methods to deliver education through computer-human interaction will be to improve the overall educational experience delivered, and allow education to be spread where it may not be able to currently. Improving education is an ever-evolving goal that should be constantly pursued to enhance one another through knowledge. Improving these systems would give the end user a better experience which would promote them to continuously use these systems, promoting their continuing education. The results of this study could aid those with preexisting systems to upgrade their tools and allow their current clients to have an enhanced learning experience. In addition, the results could be used by newcomers to the area to develop their new tools and systems to have an out of the box experience that is of much higher quality to the end user.

II. Methodology

Theoretical framework

The theoretical framework of this study is of the perspective of the utility of educational systems and their user interfaces. This is to focus the scope of the study on the user interfaces and how they can change the overall usefulness of the systems.

Type of design and assumptions that underlie it

The study will follow a strongly phenomenological design, as much of the questions aim to find out how the users feel about their experiences with the pre-established systems and how they would improve or otherwise modify the systems. Employing interviews with a selected

representative sample of students who both utilize and do not utilize the systems to try and find a broad spectrum of responses and gather the information we require to reach conclusions. Moreover, there will be case studies into the particular results found that will be used to find exactly what needs to be changed or maintained within the educational systems.

As the study progresses, there will be changes to the design as it is challenging to identify the exact methods to utilize and questions to ask without first gathering information from the sample group. The methodology will evolve over the course of study while staying grounded with the concept of gathering opinions about the human-computer interaction aspect of educational systems.

This study assumes that there is room for improvement in the systems. The assumption is validated by evidence gathered through personal experience and preliminary inquiries on the subject of the educational systems and how students interact with them, and their instructors through them.

Role of the researcher

As the study requires a highly qualitative approach to gathering data, the researcher will be responsible to gather a representative sample of students who both utilize educational systems on their computer as well as those who have not or do not consider them a feasible option. The sample must be representative as it needs to be able to project to the general population of students, as ultimately the results aim to improve educational systems and their interfaces for all systems in place or new systems that will be used for a broad spectrum of students and institutions. They will be in charge of surveying the sample selected, and on each case by case basis gets detailed information about how the users feel about their interfaces through interviews. Human-computer interaction and user interfaces deal with psychological processes, which as a result require a researcher to get in-depth information from their sample. On a quantitative front, there will be some data that is gathered about user satisfaction that will be done through surveys for those who have been selected to be a part of the sample. The nature of the role allows the researcher to be universalized.

Selection and description of the site and participants

The sampling will follow a cluster sampling design, gathering subsets from each potential sample. Students will be sampled from a wide range of schools, from technical to art to business, and within those schools the particular areas of study will also be sampled. These range from computing and to sciences, even to marketing. Schools that widely use the distance learning

educational systems will offer the majority of the users who have utilized an educational system such as Desire2Learn, allowing random sampling of clusters to occur while knowing the majority of them will be using the software, or at least had an excerpt of using it. Following this, samples would be taken from schools who have not implemented educational systems of this kind, and also those who are in the adoption stage. Within each of the schools, there will be systematic sampling done to gather individuals at random while still getting responses from all areas of the schools. The goal is to gather a fully representative, yet randomly selected, sample to be able to have valid and generalizable data towards the population. The sampling from all varieties of school is to avoid sampling bias from those schools who have already been accustomed to educational systems or similar systems.

The site of data collection, interviews, and the study will be on each campus where sampling will occur. This allows it to be a convenience for students who have been selected to be a part of the study, while still allowing comfort and privacy within a boardroom or meeting room within the schools. Ideally the site will be completely private, with strictly confidential and anonymous entering and leaving the premise, and the aim is to ensure this through keeping a careful eye on the potential meeting rooms.

Data collection strategies

Initially, there will be online surveys containing short answer questions posted within educational systems to find a direction to point the interviews towards. These will include general satisfaction questions, and brief questions asking the user how they would improve their experience. Data collected will directly affect the direction in which the study goes, in particular focusing on specific areas that tend to be of importance to the users. Interviews will be utilized to gather data. The interviews will follow an initial standard questionnaire, but due to the nature of interviews, the questions posed will change depending on the responses given and the interview will be a lot more dynamic than a static set of questions. The interviewee will be exposed to questions that ask them to elaborate on their experiences and their satisfaction while using educational systems.

The online survey will be used to help direct the interviews. For the interviews, to gather initial data, the sources will span from users who have previously used educational systems, the instructors who utilize the systems for their students, as well as those who have not previously used them. Those who have used them can be categorized into those who previously used them, but disliked the system, and those who currently use them. Data collected will be anonymous, and those interviewed will remain anonymous as well. Our intentions will be disclosed

immediately, and as a result interviewee will be completely informed and we will receive due consent on paper.

For those who have not had any exposure to the systems before, they will be able to use a demo for a course similar to their area of study; consequently, they will be able to give us their first impressions and be able to express what they feel excelled and what was lacking within the demo.

Data analysis strategies

The researcher will identify common themes, likes, or dislikes in the responses gathered from the sample. They are to identify the important aspects of information gathered, such as but not limited to, preferred layouts, which things stand out in an interface, how they felt while using the systems or how they felt during a trial run, and any suggestions they feel would help to improve the experience. Additionally, they would find those who have significantly different perspectives and seek to understand why they felt this way. Taking these opinions, they are to construct a composite of all the information they have gathered to help draw conclusions.

Furthermore, once specific questions are broken down, for example into how a user's mind tends to wonder while browsing an educational system, the details will be organized and categorized. After interpretation on a case by case basis, patterns may be identified and further generalizations may be made about improvements to the systems.

The data will also be analyzed to find correlations between the responses of the interviewee and their satisfaction, or suggestions they may have. Correlations may expose areas to focus on when improving design.

Methods of achieving validity

As mentioned in the selection of participants to the study section, the sampling will occur at multiple schools, and within those schools sample at random within each of their schools of study. The schools selected will be of all sorts of backgrounds, including those who have used the systems frequently, those who are in the adoption stage, and those who have no intention or do not use the systems at all currently. We will keep the sample anonymous, which will limit the stress on those selected to potentially have bias in their answers that may sway to either spectrum of possible opinions. Students will be able to opt into the study; however, we must keep careful track of their experiences as to not skew the data to those who have a particular bias for or against the systems.

III. Findings

Relationship to literature

Data documented can potentially be used for other systems that require user interaction and information delivery. The conclusions exposed by this study should show how a user likes to interface with information delivery, and could be generalized to other studies.

Relationship to theory

The way a student responds to the questions and how they feel about the layout of a system may expose new ideas towards how to organize a theoretical system that may have not been formerly considered.

Relationship to practice

The results of this study should allow those who work to improve their educational systems to have a better understanding with what is currently lacking, or excelling in their systems. They will be able to use the information gathered to know where to focus their efforts and what improvements can be made.

IV. Management plan, timeline, feasibility

The data collection portion will take the time of four full semesters of schooling, this will grant the study two full intakes of students, as well as the ability to gather data based on how a student's opinion changes over time. For example, a student's opinion about the organization of an educational system may change around finals time, where a lot of information at once may be beneficial. Between each data collection period, the data will be interpreted and analyzed to draw sub-conclusions. Finally, after all data has been collected, documented and interpreted, the sub-conclusions will be accumulated and interpreted, drawing final conclusions from these. This timeline is a rough estimate, and at the researchers discretion may be extended to include more semesters of schooling.

The feasibility of this study relies on the cooperation with educational institutions to allow us to use their grounds to conduct research. If this were to fail, a new site would need to be selected that is off campus, which may be inconvenient for students. It is understood that students have active schedules and may not be able to spare much time, but during quiet periods of schooling we are certain there should be quite a few students interested in improving the systems that they may feel needs improvement.

V. Literature Review

Zhang, Zhan and Du wrote their paper primarily focusing on the learning efficiency from human-computer interactions. They highlight the idea that E-Learning is “not a simple means of supporting teaching, it is necessary to focus on “educating” and pay more attention to “learning”” (Zhang, Zhan & Du, 2010, p. 1), and elaborate on how human-computer interface design is not as simple as art – requiring not only the artistic aspects, but to, in fact, adapt to people’s cognitive psychology. Their thesis focuses on the importance of cognitive psychology for e-learning and discusses how to expand the human-computer interaction design keeping in mind this psychological explanation. (Zhang et al. 2010, p. 1)

Their paper identifies six psychological processes, these being a visual search, find, identify, identification, recognition, and memory search. From these it is proposed that we can express and categorize the learning requirements and distinguish the psychological characteristics.

As a part of their research, Zhang et al. found that the learner may have difficulty finding where they started, which they define as Information Trekking, or what their original learning objectives were due to the attraction of irrelevant information and poorly organized design. They identified a few main problems, including a lack of appropriate links or links that cause confusion, poorly organized information structures that do not follow a standard or norm, and lastly irrelevant information. To solve these problems, some fixes were proposed:

Rational use of links: Consider the user, and how the user responds to selecting a link. As an example, an adult can easily distinguish text and know where they will lead them in most cases, whereas a child may require a dynamic visual image to attract their attention.

Make information consistent: Using the cognitive psychology ideals, utilize a reasonable layout, containing an information analytic hierarchy and universal standards on the organization of information.

Effective Selection: When there is too much information to display at one time, create a unified solution to minimize the chance of confusion. Hyperlinks are simple, but with excessive use risk confusing the user; thus, choose a fixed way of displaying links in a uniform matter to improve the accuracy of cause and effect to the user.

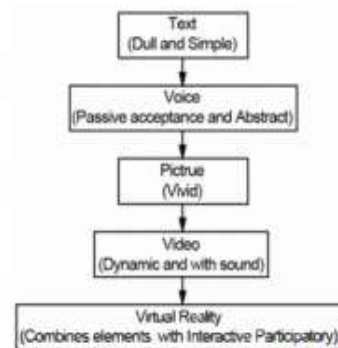


Fig. 1. Progressive cognitive affection of different media

In continuation, the paper explains that when evaluating and optimizing the human-computer interaction design of an e-learning system, first the weights of different indices need to be considered, such as the cognitive effects, organization structure, and interaction within the design, and then further divide the users of e-learning systems into four types of casual, unfamiliar, skilled and expert users. For example, a child is a casual user, where the interface should be interesting and cartoon-like; yet adults with higher computing experience may be distracted with cartoon images. They utilize a BP neural network algorithm to optimize the human-computer interaction, by first building a BP neural network structure and after using formulae given to calculate outputs from the graph, finding minimum deviation between target values and the actual output from the layouts will give optimal designs. By experimentation, they developed a folk-art digital museum where e-learning technology was used for art and design students to learn and promote their knowledge of folk art. They fully analyzed and considered the factors of the age of art and design students, their professional backgrounds, and their computer knowledge. Based on these values, they created their human-computer interaction scheme through their BP neural network to evaluate and optimize their potential schemes.

VI. References

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VII. Appendixes

Appendix A: Discussion Guide for the Qualitative Interviews

Question 1: Top Issues

What are the top 3 issues that you face while using the current educational systems such as [system used by their institution]

Sub-Questions

- a. What stands out to you when using [system used by their institution]?
- b. How would you change [system used by their institution], assuming you had free reign over it?

Question 2: User Interface

How do you feel about the arrangement and organization of [system used by their institution]?

Sub-Questions

- a. Is the organization of the navigation intuitive?
- b. Can you tell me what you think excels in this system?
- c. Conversely, can you tell me of any issues you have faced while using the system?

Question 3: Psychological Effects

How do you feel about using the system?

Sub-Questions

- a. Does it appeal to you to use the system instead of handing in physical copies, or visiting the institution?
- b. Do you enjoy using the system?
- c. Does the system ease or enhance your educational needs through usage

Appendix B: Participants Ethics Consent Form

I consent that BCIT Graduate, **Muhammad Aboulkhoudoud**, may interview me and ask me questions about my experiences with distance educational systems with regards to their user interfaces and how I interacted with the systems.

I confirm that in advance of this interview, I received, from **Muhammad Aboulkhoudoud**, a letter informing me of the interviews information as well as was able to contact them for any questions I had.

I understand that the data collected from the interviews will be anonymous and as such cannot identify me in any way, and that my responses are private and confidential. I also understand that I am able to opt out of the interview at any time, and request my data to be erased. Furthermore, I may decline to answer any questions without penalty.

I understand that all research assistants working on this project will sign a confidentiality agreement, and will comply with ethics standards.

I understand that the plan for this study has been reviewed for its adherence to ethical guidelines, and for any questions regarding the ethical conduct I may contact the International Ethics Board at 1-800-469-0230.

I hereby give my permission to be interviewed; I understand that the interview will be recoded and that the recordings will be used for research purposes only.

Participants Signature:

Interviewer's Signature

Date:
