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# Advancing the Multidisciplinary Nature of HCI in an Undergraduate Course

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## 1. Introduction

The aim of this chapter is to describe the development of an undergraduate Human Computer Interaction (HCI) course that is taught from a multidisciplinary perspective to a multidisciplinary audience using themes from the various disciplines that are encompassed within HCI. Consequently, the goals of this chapter are to:

- Describe HCI
- Introduce HCI as a multidisciplinary field
- Expound on the various disciplines encompassed within HCI
- Describe the development of an undergraduate course from a multidisciplinary prospective
- Suggest ideas for future work

## 2. What is HCI?

### 2.1 Overview

Technology is a mainstay in today's society. Whether at home, school, or in the workplace, people use technological systems. Consequently, the average user is now less likely to understand the systems of today as compared to the users of 30 years ago. Therefore, the designers and developers of these systems must ensure that the systems are designed with the three "use" words in mind so that the product is successful. Hence, the system must be useful, usable, and used (Dix, et al., 2004). The last of the "use" terms has not been a major factor until recently, thereby making the discipline of human-computer interaction increasingly more important.

Human-computer interaction has been described in various ways. Some definitions suggest that it is concerned with how people use computers so that they can meet users' needs, while other researchers define HCI as a field that is concerned with researching and designing computer-based systems for people (Benyon, et al., 1998; Sharp, et al., 2007). Still other researchers define HCI as a discipline that involves the design, implementation and evaluation of interactive computing systems for human use and with the study of major phenomena surrounding them (Preece, et al., 1994). However, no matter what definition is chosen to define HCI, the concept that all these definitions have in common is the idea of the technological system interacting with users in a seamless manner to meet users' needs.

## 2.2 The human user

The human user may be an individual or a group of users who employ the computer to accomplish a task. The human user may be a novice, intermediate, or expert who uses the technological system. Further, the human user may be a child using the system to complete a homework assignment or an adult performing a task at work. Additionally, the human user may be a person who has a physical or cognitive limitation which impacts his/her use with the computer-based system. No matter who the human user is, the goal when interacting with a computer system is to have a seamless interaction which accomplishes the task.

## 2.3 The computer system

According to the *Random House Unabridged Dictionary*, a computer is defined as an electronic device designed to accept data, perform prescribed mathematical and logical operations at high speed, and display the results of these operations (2006). However, as computers become more complex, users expect more than just a display of the results of their operations. The term computer system is used to represent technology and technological systems. Consequently, technology or technological systems encompass many different aspects of computing. Users now require their systems to be able to provide answers to questions, to store various forms of information such as music, pictures, and videos, to create a virtual experience that physically may be unattainable, and to understand verbal, visual, audio, and tactile feedback, all with the click of a button. As the human user becomes to depend on these technological systems more, the interaction between the user and the system becomes more complex.

## 2.4 The interaction

Interaction is the communication between the user and the computer system. For computer systems to continue their wide spread popularity and to be used effectively, the computer system must be well designed. According to Sharp, Rogers, and Preece, a central concern of interaction design is to develop an interactive system that is usable (2007). More specifically, the computer system must be easy to use, easy to learn, thereby creating a user experience that is pleasing to the user. Consequently, when exploring the definition of interaction, four major components are present which include:

- The end user
- The person who has to perform a particular task
- The context in which the interaction takes place
- The technological systems that is being used

Each of these components has its own qualities and should be considered in the interaction between the computer system and the user. In his bestselling book, *The Design of Everyday Things*, Donald Norman writes about these components and how each must interact with the other, suggesting that the common design principles of visibility and affordance help to improve interaction (2002). The principle of visibility emphasizes the idea that the features of the system in which the user interacts should be clearly visible and accessible to human sense organs, which improves the interaction between the action and the actual operation (Norman, 2002). The principle of affordance as suggested by Jef Raskin, should accommodate visibility such that the method of interacting with the system should be apparent, just by looking at it (2000).

Therefore, in order to create an effective user experience, a designer of an interactive computer system must understand the user for which the system is being created, the technological system that is being developed and the interaction that will take place between the user and the computer system. An ideal designer of these systems would have expertise in a wide variety of topics which include but are not limited to psychology, sociology, ergonomics, computer science and engineering, business, art and graphic design, and technical writing. However, it is impractical to assert that any one designer should have expertise in all these areas. Furthermore, when the concepts of HCI are introduced to students who eventually become designers of these systems, the course is typically taught in a computer science department, by a computer science professor, to computer science majors.

### 3. HCI as a Multidisciplinary Field

#### 3.1 The discipline of HCI

HCI is a field that brings many disciplines together and is regarded as a highly multidisciplinary field. There are several main disciplines that are encompassed within HCI. Figure 1 provides a graphical representation of the many academic fields that are often included in HCI. This section will briefly introduce the disciplines and suggest why each is an important area of HCI and is therefore, relevant for inclusion in an undergraduate HCI course.

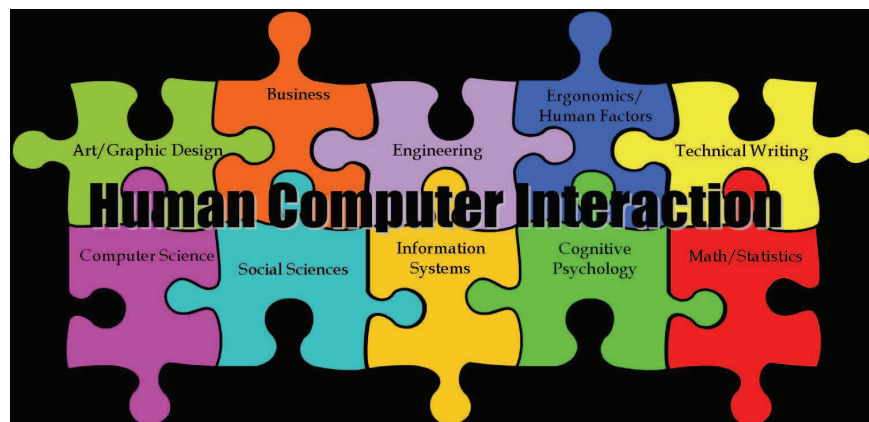


Figure 1. The Disciplines of HCI

#### 3.2 Art and Graphic Design

In order to design products that are useful, usable, and used, the disciplines of art and graphic design are essential. While psychologists bring to the field of HCI the understanding of how humans act and react to technology, and computer scientists and engineers design and develop the computer systems, and the area of human factors enhances knowledge about the physical environment in which the system will be used and the social sciences help obtain accurate descriptions about the user, without the areas of art and graphic design, most systems would not be used. Artists and graphic designers put a “face” on the system and thereby with a good design and use of color, artists and graphic designers help to make the interaction between the user and the system enjoyable and seamless. Graphic designers often use typography, visual arts and rules for page layouts to assist with the design of an interface for a system. Meanwhile, the discipline of art brings to HCI a creative process by which interaction takes place between the user and the computer system. Artists help to bridge the gap between designing the system for the user and making the system usable by the user.

### 3.3 Business

The business field is wide. Various areas of business include business administration, accounting, economics, finance, management, and sales and marketing. At the core of each of these areas lies a knowledge base that HCI uses to its benefit. Whether it includes how to sell and market a computer system that capitalizes on user sensory interaction with a system, or if it includes e-commerce management, all the areas of business contribute to the HCI discipline. While all cannot be covered in an undergraduate course in HCI, it is important for students to understand the role that business plays within the discipline.

### 3.4 Engineering

ABET, Inc., the recognized accrediting agency for college and university programs in applied science, computing, engineering, and technology, has defined engineering as “[T]he creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property.” Engineering plays a very specific role in HCI ensuring that systems are designed and developed according to specifications.

### 3.5 Ergonomics and Human Factors

The term ergonomics originally coined in Europe or its United States counterpart, human factors, is traditionally the study of the physical characteristics of interaction (Dix, et al., 2004). More specially the discipline is concerned with how the controls are designed, the physical qualities of the screen, and the physical environment in which the interaction between the user and the system takes place. The goal of human factors is to optimize human well-being and overall system performance.

The discipline of human factors is important to the field of HCI as it focuses on the user’s capabilities and limitations. For example, the arrangement of controls and how information is displayed, the physical environment of the user such as whether the user will be sitting or standing, using the system in a lighted room of artificial or natural light, and how color will be used, are some of the many human factors studied which contribute to the field of HCI. Consequently, students must understand how human factors impact system performance.

### 3.6 Technical Writing

Technical writing is concerned with the presentation of information that helps a reader solve a specific problem. Technical writing has been called a form of technical communication that is frequently used to demystify technical terms and language. Technical communicators write and design many kinds of professional documents which include but are not limited to manuals, lab reports, web pages and proposals. Often students have been exposed to writing and creating documents during their undergraduate career, but many have not written documents that explain technical concepts. Technical writing contributes to the field of HCI as it provides a form of communication that helps to enhance the interaction between the user and the computer system.

### 3.7 Computer Science

Computer science is a discipline that is concerned with the study and the science of theories and methods that underlie technological systems. Computer science can also be thought of

as the study of computer hardware, and the study, design and implementation of computer software. HCI for many years has been thought to be a sub-discipline of computer science. However, as computer systems become more complex, requiring a heightened level of interaction between the user and the computer system, HCI encompasses the field of computer science as it does many other disciplines.

Computer system design includes a variety of activities that range from hardware design to interface design. Consequently, careful interface design plays an essential role in the overall design of interaction between the user and the computer system. The themes from computer science's software design are therefore, very prominent in the user interface design of HCI.

### **3.8 Social Sciences**

Although, HCI has often been linked with the "hard sciences" of computer science and engineering, it is the "soft sciences" of sociology and anthropology that bring to the forefront of the discipline the impact and influence that technology has on its users. A major concern of the social sciences is to understand the interaction between the computer system and the user both during and after the event. Therefore, the reasons for including the social sciences in HCI are to obtain a more accurate description of the interaction between users, their tasks, the technological systems that they use and the environment in which they use the systems (Preece et al., 1994).

### **3.9 Information Systems**

Information systems sometimes called management information systems, is considered to play a major role in HCI. Information systems, is an applied discipline that studies the processes of the creation, operation, and social contexts and consequences of systems that manipulate information. It also includes the analysis, development, and management of systems.

The area of information systems has two distinguishing features that place information systems within the context of HCI: (1) business application and (2) management orientations (Zhang, 2004). Consequently, information systems works well as one of the many disciplines of HCI because it is concerned with the study in which humans interact with information, technologies, and tasks in business, organizational, and cultural environments. Simply put the discipline of information systems helps HCI to go beyond the theoretical concepts of computer science to a more applied approach while taking into account issues related to social and organizational constructs.

### **3.10 Math and Statistics**

Evaluation is concerned with gathering information about the usability of a system in order to improve system performance (Benyon et al., 1993). Without evaluation, user requirements may not be met or system performance may be low, all leading to an unpleasant user experience. However, in order to evaluate a system, data concerning the user's interaction with the system and the user's attitudes towards the system must be collected and analyzed. Consequently math, primarily statistics, plays an important role in the evaluation of a system and the user.

Statistical testing helps to present the results of evaluation in a useful and meaningful manner. Consequently, if researchers are observing the behavior between the user and the computer repeatedly, comparing one group of users to another group of users, studying one group of users comprised of individuals differing from one another, or simply presenting background information on a group of users, statistics is needed.

### 3.11 Cognitive Psychology

In order to design a product for the user, it is important to know the user's capabilities and limitations. The discipline of cognitive psychology provides knowledge of the user's perceptual, cognitive and problem-solving skills. Cognitive psychology is needed in order to understand the manner in which humans act and react. More importantly, cognitive psychology is used to understand how users will interact with technological systems and devices.

Of particular interest to HCI is the human information processing system which is akin to the computer information processing system. The human information processing system, according to various researchers consists of three subsystems which include: the perceptual system, which handles sensory information; the motor system, which controls actions; and, the cognitive system which provides the processing needed to connect the sensory information with the motor system (Card, et al., 1983). The computer information system includes: input devices which accepts information by apparatuses such as a keyboard or mouse; output devices which include peripheral devices; and, the central processing unit which combines the arithmetic and logic unit with the control unit to transform user input to output. Figure 2 shows the correlation between the human information processing system and the computer information processing system.

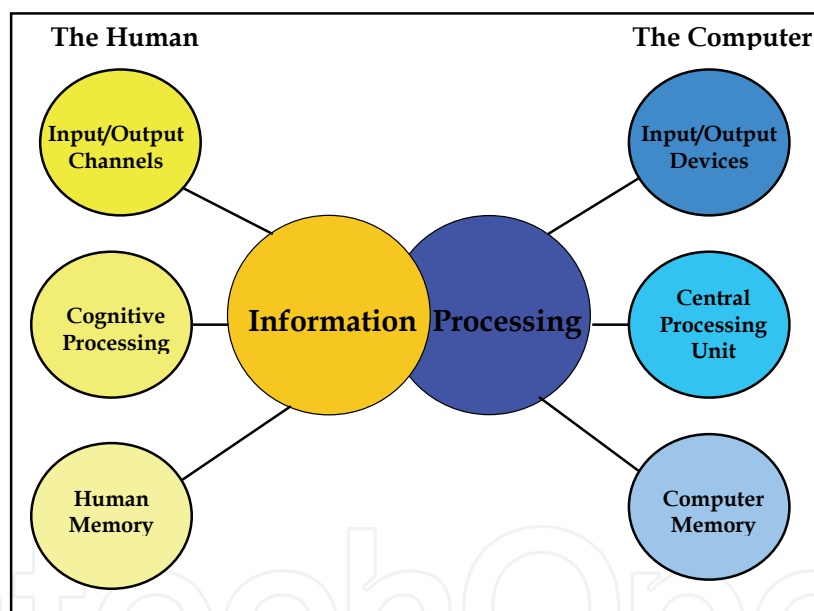


Figure 2. Information Processing

## 4. The HCI Curriculum

In 1988, the ACM Special Interest Group in Computer-Human Interaction organized and created a Curriculum Development Group (CDG) whose specific task was to produce a set of recommendations for education in HCI. The CDG acknowledged the multidisciplinary nature of the field, but also stated that the HCI undergraduate curriculum should be embedded within an existing disciplinary curriculum, namely computing programs (ACM 1991). Computing programs were chosen because the CDG felt that the computing disciplines "are a natural place to start" since the programs cover a broad spectrum in computing (ACM, 1991). Consequently, a review of many undergraduate programs found

that HCI was typically taught in computer science departments with a heavy focus on user interface design. Yet the CDG acknowledged that “ideally” an HCI specialist would be generally comfortable in handling technological issues, the needs of individuals, and handling the concerns of their organizations and workgroups (ACM, 1991). Therefore, to prepare students with the skills needed to handle the human component of the HCI discipline, similar courses were found in Psychology Departments with a heavy emphasis on human factors, cognitive science and problem-solving principles.

With this premise in mind, the idea of the newly developed course in HCI was to draw a cross section of students from the various disciplines on campus to provide them with the basic knowledge of HCI principles taught from a multidisciplinary perspective. It was the intent of the newly developed course to bridge the gap between the courses and to offer a multidisciplinary learning experience to an undergraduate multidisciplinary audience.

The next section describes the development of an undergraduate human computer interaction course that was developed and taught from a multidisciplinary perspective to a multidisciplinary audience using themes from the various disciplines that are encompassed within HCI.

## **5. A New Approach**

Prior to spring semester 2005, a HCI course had not been offered. Students received some instruction in HCI principles in several of the upper-level division computer programming courses that they took or in the senior level software engineering course required for all computer science majors. However, the only students enrolled in these courses were computer science students. Consequently, the new course had to be structured so that students who were majoring in other disciplines could take the course and not feel intimidated by the computer programming requirements sometimes associated with the computer science major and upper level division computer science courses. Furthermore, since the new course was designed to cater to a multidisciplinary audience, the focus of the course could not merely be on user interface design but also would include discussion on the human user, the interaction between the user and the computer system, and on the evaluation of computer systems. The new approach to the course focuses on developing a course that encompasses the themes central to HCI.

To further incorporate the concepts of a multidisciplinary learning experience, a different teaching approach was incorporated. The next section introduces various teaching methods and explains why the facilitator teaching style using peer teaching was ultimately chosen and employed as the teaching style for the HCI course.

### **5.1 Teaching style**

Education literature states there are four styles of teaching (Grasha, 1994). To ascertain the most appropriate teaching strategy for the development of a new HCI course, the four teaching styles, formal authority, demonstrator/personal model, facilitator, and delegator were assessed. A brief description of each is presented in the next sections.

#### **5.1.1 Formal authority**

The formal authority teaching style is an instructor-centered approach where the instructor is responsible for providing and controlling the flow of the content and the student is



expected to receive the content. The advantage of this method is that the instructor provides the instruction, knowledge and skills, and therefore the material is thoroughly conveyed. The disadvantages of this method are that a heavy display of knowledge can be intimidating to less experienced students and students do not build relationships with their peers because team work and collaboration are not fostered.

### **5.1.2 Demonstrator**

The demonstrator/personal model approach is also an instructor-centered approach where the instructor demonstrates the skills that students are expected to learn. This approach encourages student participation and instructors adapt their presentation to include various learning styles. The advantage of the demonstrator/personal model method includes an emphasis on direct observation. However, the disadvantages to this approach conclude that some instructors may be too rigid and therefore discourage a personalized approach by students and if they cannot complete the task as effectively as the teacher, some students may become discouraged and frustrated.

### **5.1.3 Facilitator**

The facilitator method is a student-centered approach. The instructor acts as a facilitator and the responsibility is placed on the student to achieve results for various tasks. This type of teaching style fosters independent learning as well as collaborative learning. The instructor typically designs group activities which necessitate active learning, student-to-student collaboration and problem-solving. The learning situations and activities require student processing and application of course content in creative and original ways. This type of teaching approach provides options or alternatives for students and encourages higher-level thinking skills. The limitation to this approach is that it is time-consuming to prepare materials and the instructor and materials must be flexible.

### **5.1.4 Delegator**

The delegator teaching style is a student-centered approach where the instructor delegates and places the control and the responsibility for learning on the students and/or groups of students. The delegator method often gives students a choice in designing and implementing their own complex learning projects while the instructor acts in a consultative role. The advantages to this approach include high levels of collaboration and active learning. However, the limitations to this approach conclude that much of the control and responsibility for learning is placed on individuals or groups of students, which may not be the best environment for some students.

The facilitator teaching style was chosen because it is a student-centered approach which shifts the focus of activity from the teacher to the learners. This method includes active learning, collaborative learning and inductive teaching and learning (Felder, 1996). The facilitator teaching style has been stated to work best for students who are comfortable with independent learning and who can actively participate and collaborate with other students (Grasha, 1994). In particular, this approach was chosen because in education literature, the method has been shown to increase students' motivation to learn, to lead to a greater retention of knowledge, and to positively impact attitudes toward the subject material being taught (Bonwell, 1991; Johnson & Johnson, 1994; Meyer & Jones 1993). Additionally, the method places a strong emphasis on collaborative learning.

## 5.2 Collaborative learning

Students learn best when they are actively involved and engaged in the learning process. In educational environments, study groups are often formed to gain better insight on course topics through collaborative efforts. Collaborative learning is defined as the grouping and/or pairing of students for the purpose of achieving an academic goal (Gokhale, 1995). Davis reported that regardless of the subject matter, students working in small groups tend to learn more of what is taught and retain it longer, than when the same content is presented in other more traditional instructional formats (1993).

Supporters of collaborative learning suggest that the active exchange of ideas within small groups not only increases interest among group participants, but also helps to improve critical thinking skills. The shared learning environment allows students to engage in discussion, take responsibility for their own learning, hence becoming critical thinkers (Gokhale, 1995). Students are responsible for their own learning as well as the learning of others. Research has shown that collaborative learning encourages the use of high-level cognitive strategies, critical thinking, and positive attitudes toward learning (Wang & Lin, 2006). Further, Johnson and Johnson suggest that collaborative learning has a positive influence on student academic performance (1994).

## 5.3 Peer teaching

Collaborative learning takes on a variety of forms, one of which is peer teaching. Peer teaching is one of the oldest forms of collaborative learning in American education with its roots in the one-room schoolhouse educational setting. Peer teaching is defined as students learning from and with each other in ways which are mutually beneficial and involve sharing knowledge, ideas and experience between participants (Rubin & Herbert, 1998). Plimmer and Amor reported in their evaluation of student responses in an HCI course that fostered peer teaching, that there was a substantial sharing of knowledge and that students found this exchange useful (2006). The study further found that the sharing of existing knowledge with peers enriched the learning experience and contributed to an appreciation of the multiple disciplines encompassed within HCI. Similarly, in a study conducted by Rubin and Herbert found that the benefits to the peer teacher included a sense of empowerment, an increased sense of mastery and self-efficacy (1998). It has been further suggested that the peer being taught learned more, than from traditional, teacher-centered approaches.

## 6. Course Development

### 6.1 Course description

The description of the course, *CSCI 499G – Human Computer Interface*, is to provide students with an introduction to human computer interaction and to also expose them to current research topics within the field.

The prerequisites for the course are at least junior standing (a completion of at least sixty credit hours) with a minimum of two computer science courses, one of which had to be a programming course. The prerequisites were chosen to ensure that students had some programming experience and that they had completed many of the general university requirements some of which included courses in the social sciences and humanities where some of these concepts would be used in the HCI course.

## 6.2 Learning outcomes

Learning outcomes are extremely important when developing a course. The learning outcomes describe the specific knowledge and skills that students are expected to acquire. The learning outcomes for *CSCI 499G* included the following, and at the end of the course a student should be able to:

- Clearly state what the multidisciplinary nature of human computer interaction is and its origin.
- Identify the different areas of study within and current research topics related to the HCI discipline.
- Identify the basic psychological and physiological attributes of computer users.
- Describe and identify the components and devices of computer systems.
- Describe the fundamentals of the HCI design process.

To meet the objectives of the course outcomes, the content of the course included:

- Introduction to HCI
- The Human Component of HCI
- The Computer Component
- Interaction Basics
- The Design Process
- Evaluative Techniques
- Current Topics in HCI

Table 1 is an outline of the topics covered during the sixteen week semester (Lester, 2007).

WEEK	TOPIC
1	Introduction
2	Historical Perspective of HCI
3	Chapter 1 - The Human
4	Chapter 1 - The Human
5	Chapter 2 - The Computer
6	Chapter 2 - The Computer
7	Chapter 3 - The Interaction
8	Chapter 3 - The Interaction <i>Midterm Examination</i>
9	<b>SPRING BREAK NO CLASS</b>
10	Chapter 5 - Interaction design basics
11	Chapter 7 - Design rules
12	Chapter 9 - Evaluation techniques
13	Chapter 9 - Evaluation techniques
14	Chapter 10 - Universal design
15	Chapter 10 - Universal design
16	Putting it all together
17	<i>Final Examination</i>

Table 1. Weekly course schedule

Students were assessed through homework, three class projects, and a paper in special topics. Additionally, two exams were administered.

The next section presents how homework and class projects were designed and used to introduce to students the multidisciplinary nature of HCI.

## 7. Student Assessment

### 7.1 Homework

The homework assigned was not the typical homework of answering questions taken from class readings or from the questions at the end of each chapter of the required course textbook. Instead, homework was taken from human engineering exercises (Bailey, 1996). These exercises required students to solicit random volunteers, ask the volunteers to perform specific tasks, and then to submit a report. The report was to be type-written and no more than two pages in length. The report contained the following sections:

- Purpose of the study
- Method used
- Results
- Discussion of results
- Concluding thoughts

Often, computer science and engineering students receive no formal instruction on how to conduct a study using human participants or how to write and submit a scientific report. By choosing this homework method, the concepts within the social sciences, technical writing, and human factors disciplines were reinforced.

### 7.2 Class projects

There were three class projects assigned during the course of the sixteen week semester. The projects were designed such that each incorporated some aspect from the many disciplines encompassed within HCI. Each project was named after a popular American television show to encourage active student involvement and to create an environment where real-world applications could be used. Students used collaborative learning and peer teaching to complete the projects.

#### 7.2.1 Project I

Project I was named *Extreme Makeover*. The television show features a home that is in desperate need of repair and renovation. The class project required students to redesign the interface of a display device. The students were asked to create a physical prototype of the device. Specific instructions for the creation of the prototype included that the device could not be any larger than one 8½ X 11" sheet of paper and no smaller than the size of regular-sized PDA. The device could not weigh more than one (1) pound. Additionally, the device should use text entry or a positioning, pointing, or drawing device.

Additionally, in creating a physical device, students were also required to produce a technical document. The document included the following: a statement of the problem and introduction to the device; an outline of the specifications for the device; an explanation of how the device was to be used; a statement about the skills that the user of the device must possess, if any (is training necessary?); a statement concerning the sensory channels needed to operate the device; as well as the advantages and limitations of the design.

The project encouraged students to be creative and focused on the principles found in the disciplines of art and graphic design, cognitive psychology, ergonomics and human factors,

and technical writing. Students were assessed on the written report as well as the creativity and presumed usability of physical prototype.

### 7.2.2 Project II

Project II was named *Design on a Dime*. The television show features homeowners who would like to redesign one room of their home, using limited financial resources. The class project required students to design and develop a user interface for a clothing store that needed to track inventory. Students were only asked to create the interfaces which allowed employees to input a product number and determine if the merchandise existed and how much of the merchandise was in stock; hence, the concept of design using limited resources was utilized. Additionally, students were asked to create a persona that described the core user group, a scenario that described an example of how the ordering tool would be used and a network diagram that illustrated the main screens or states of the ordering tool.

Also, as in Project I, students were asked to submit a technical report. The report included a statement of the problem and an introduction to the ordering tool, the description of the ordering tool, the persona, the scenario, the network diagram, an illustration or figure of the first screen for the ordering tool and also the advantages and limitations of the design.

For Project II, the main focus was on the concepts found in the information systems, computer science, engineering and the business disciplines. Computer programming was required for this project. However, the focus was not to design and develop a program, but to concentrate on the interface that the employees would use and the business concepts required for this type of development. Technical writing was also a focus in this project. Students were assessed on the screen design and layout, and also on usability including learnability, flexibility, and robustness. Students were also assessed on the written report.

### 7.2.3 Project III

Project III was called *America's Next Top Model*. The television show focuses on the search for the next super runway model. The objective of Project III was to use the experimental evaluation technique discussed in class to conduct an evaluation. More specifically, the class project required students to solicit random participants (no fewer than six and no more than ten) who evaluated two interfaces of various web search engines. Students were asked to develop two testable hypotheses, to use descriptive statistics to make inferences about the population and to also display results from statistical tests. While it was explained to the students that the population size limited the type of statistical tests that could be used, the idea was expose students to experimental evaluation.

A written report was required from the students which included: a statement of the problem; an introduction to the search engines, including the important features of each and an illustration of each; a description of the evaluative technique used, including the stated hypotheses; the results; a discussion of the results and concluding thoughts; and an appendix containing the hard copies of the end user survey. An end user survey created by the author was provided to the students.

The project focused on the concepts of data collection, evaluation, analysis of data, and presentation of results. The principles found in the disciplines of the social sciences, cognitive psychology, math, primarily statistics, were the focus of this project. Students were assessed on the written report.

### 7.3 Special topics in HCI

Students were asked to select any current topic in the HCI field to research, which was not presently covered in class. Students were required to write a research paper on the topic and to present the paper in class. The paper was to be type-written and between eight and ten pages in length. The parts of the paper included: an introduction to the topic; a review of the literature on the topic; an analysis of the topic; and a summary and concluding thoughts. Additionally, students were required to follow either the *IEEE Computer Society Style Guide* or *The Publication Manual of the American Psychological Association*.

The focus of this project was the multidisciplinary nature of HCI. Students were assessed on degree of content, scholarly synthesis of literature, organization, grammar, and style.

## 8. Discussion

The course has been offered twice, once during the spring 2005 semester and again during the spring 2007 semester. Students were asked to complete a short survey after the completion of the course. The review of the survey revealed the following:

- Students left the course with an appreciation for the various disciplines that are encompassed within the HCI discipline
- Students understood the need for user interface design and that it was important to include the user throughout the design lifecycle
- Interface design is much harder than just choosing colors and buttons
- The creation of an evaluation tool is difficult and that users do not always answer the questions in the manner requested
- Users do not always use the interface in the manner in which they are requested

When asked about the course itself, the students expressed the following:

- Although nervous at first about the course set-up, students stated that they enjoyed the material and the computing majors expressed a desire for more courses that promoted a student-centered teaching approach
- They enjoyed using collaborative learning to complete the projects
- They liked the idea of presenting their projects and the paper on the selected special topic which provided them with an opportunity to practice public speaking
- They enjoyed taking classes with “other” majors which provided a different perspective as it related to problem-solving

## 9. Limitations and Future Work

### 9.1 Limitations and challenges

Developing a course that is multidisciplinary in nature proved to be quite challenging. This section describes some of the challenges that the author encountered.

One of the challenges that the author encountered was the use of the facilitator style teaching pedagogy during class meetings. Many of the computer science and engineering students expressed their discomfort with this approach because they had no prior experience with a student-centered approach to learning. Consequently, getting the students to understand that formal authority was only one style of teaching and that other methods exist was quite difficult. However, the psychology students who were familiar with this teaching style were quite comfortable from the onset.

Another challenge was getting non-computer science majors to register for the course. Many students still see computer science as programming, only. Therefore, encouraging a cross section of students to enroll in the course proved to be quite difficult. The majority of students who enrolled in the course both semesters were computer science, engineering, and psychology majors.

An additional challenge was selecting course projects for students of varying ability. Although the students liked the idea that projects were based on popular television shows, ones to which they could relate, students still expressed certain levels of discomfort. While the students from the technical disciplines were very sure of their computing ability, they were less confident with their technical writing skills, and with the disciplines that related to human factors. Similarly, the students with a major in psychology were quite comfortable with human factors topics and less confident with the technical subject matter. This finding is consistent with prior research which suggests that although multidisciplinary approaches in HCI courses introduce the work practice of various disciplines, the designing of these types of learning experiences is difficult (Adamczyk & Twidale, 2007).

## 9.2 Suggestions for future work

Now that the course has been taught twice with the next offering proposed for the spring 2009 semester, the author has decided to make the following changes:

- Infuse both the formal authority and facilitator teaching styles into class meetings so that despite the discipline, students are comfortable with the teaching style
- Promote the course as an interdisciplinary offering so that students from other disciplines (i.e., sociology, business, etc.) will be encouraged to enroll in the course
- Continue the development of additional course projects that focus on the multidisciplinary nature of the field
- Develop a quantitative survey so that student survey responses can be measured and analyzed
- Continue to emphasize the multidisciplinary theme throughout the course
- Invite guest lecturers from industry and other academicians who focus on HCI research

## 10. Implications

A well-known HCI mantra is “users perform tasks using computers (Sharpe et al., 2007).” The implication from this statement is that designers and developers of these systems must understand the user, the technological system and the tasks that the users expect to perform. More specifically, in order to create an effective user experience, a designer of an interactive computer system must understand the user for which the system is being created, the technological system that is being developed and the interaction that will take place between the user and the computer system.

An ideal designer of these systems would have expertise that ranges in a wide variety of topics which include but are not limited to psychology, sociology, ergonomics, computer science and engineering, business, art and graphic design, and technical writing. However, it is not possible for one person to be proficient in all areas. Therefore, if we as educators are to provide our students with the tools needed for leadership roles within the development process of HCI, we need to consider the development of a truly interdisciplinary course. The course should encompass the themes central to the HCI discipline and integrate the paradigms from various discipline-oriented perspectives.

It is the intent of the author to expand the dialogue that is already taking place between educators from various disciplines. It is the expectation that the infusion of the multidisciplinary themes of HCI into an undergraduate course leads to the creation of effective user experiences where the designers of interactive computer systems understand the user for which the system is being created, the technological system that is being developed and the interaction that will take place between the user and the computer system.

## 11. Conclusion

In summary, the aim of this chapter was to: describe HCI; introduce HCI as a multidisciplinary field; expound on the various disciplines encompassed within HCI; describe the development of an undergraduate course from a multidisciplinary prospective; and, to suggest ideas for future work. HCI has been described in a multitude of ways; however, the main theme of HCI emphasizes the idea of the technological system interacting with users in a seamless manner to meet users' needs. Therefore to meet the needs of the user, HCI interleaves the "soft skills" with technical proficiency. As a result the field of HCI is constantly changing and becoming more complex as user expectations of technical systems becomes greater. Consequently, human-computer interaction will continue to make advances and so will its multidisciplinary nature.

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## 14. References

- Adamczyk, P. & Twidale, M.B. (2007). Supporting Multidisciplinary Collaboration: Requirements for Novel HCI Education. *CHI 2007 Proceedings, Learning & Education*. pp. 1073 - 1076, 978-1-59593-593-9, San Jose, CA, April 2007, Association of Computing Machinery, New York City.



- Bailey, R.W. (1996). *Human Performance Engineering*. 3<sup>rd</sup> Edition. Prentice Hall, 0-13-149634-4, Upper Saddle River, NJ
- Benyon, D; Davies, G; Keller, L.; Preece, J & Rogers, Y. (1998). *A Guide to Usability*, Addison Wesley, 0-201-6278-X, Reading, MA
- Bonwell, C.C. & Eison, J.A. (1991). Active learning: Creating excitement in the classroom. *ASHE-ERIC Higher Education Report No. 1*. Washington, DC: George Washington University.
- Card, S.K.; Moran, T.P & Newell, A. (1983). *The Psychology of Human-Computer Interaction*, Lawrence Earlbaum Associates, 0-898-592437, Mahwah, NJ
- Davis, B.G. (1983). *Tools for Teaching*. San Francisco: Jossey-Bass Publishers. 978-1-55542-568-5, Hoboken, NJ
- Dix, A.; Finlay, J; Abowd, G.B & Beale, R. (2004). *Human-Computer Interaction*. Prentice Hall, 0130-461091, Boston, MA
- Felder, R.M., & Brent, R. (1996). Navigating the Bumpy Road to Student-Centered Instruction. *College Teaching*. Vol. 44 (43-47)
- Gokhale, A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education* 7, no. 1. 1995.
- Grasha, A.F. (1994). A matter of style: The teacher as expert, formal authority, personal model, facilitator, and delegator. *College Teaching*. Vol. 42, (42-149)
- Johnson, R. T & Johnson, D.W. (1994). An Overview of collaborative learning. *Creativity and Collaborative Learning*; Baltimore: Brookes Press. [Electronic Version]. <http://www.cooperation.org/pages/overviewpaper.html> (Assessed on August 31, 2006).
- Lester, C. (2007). *CSCI 499-G Human Computer Interface Course Syllabus*. Department of Computer Science, Tuskegee, University. <http://www.tuskegee.blackboard.com>
- Meyers, C., & Jones, T.B. (1993). *Promoting active learning: Strategies for the college classroom*. Jossey Bass, 1-55542-524-0, San Francisco, CA
- Norman, D. (2002). *The Design of Everyday Things*. MIT Press, 978-0-262-64037-4, Cambridge, MA
- Plimmer, B. & Amor, R. (2006). Peer teaching extends HCI learning. *Proceedings of the 11<sup>th</sup> Annual SIGCSE Conference on Innovation and Technology in Computer Science Education*. 1-59593-055-8, Bologna, Italy, June 26-28, Association for Computing Machinery, New York City
- Preece, J.; Rogers, Y.; Sharp, H.; Benyon, D.; Holland, S. & Carey, T. (1994). *Human-Computer Interaction*. Addison Wesley, 0-201-62769-8, Reading, MA
- Raskin, J. (2000). *The Humane Interface*. Addison Wesley, 0-2-1-37937-6, Boston, MA
- Rubin, L. & Herbert, C. (1998). Model for active learning: Collaborative peer teaching. *College Teaching* Washington, Vol. 46, No. (26-31)
- Sharpe, H.; Rogers, Y. & Preece, J. (2007). *Interaction design: beyond human-computer interaction 2<sup>nd</sup> ed.* John Wiley & Sons Ltd, 978-0-470-01866-8, England
- Wang, S. & Lin, S. (2006). The effects of group composition of self-efficacy and collective efficacy on computer-supported collaborative learning. *Computer and Human Behavior*. Volume 23, Issue 5 (2256-2268) 0747-5632
- Zhang, P; Nah, F. & Preece, J. (2004). HCI Studies in MIS. *Behaviour & Information Technology*, Vol. 23, No. 3, 147-151.
- ACM/IEEE-CS Joint Curriculum Task Force. (1991). *Computing Curricula 1991*, ACM Baltimore, MD. (Order No. 201880).
- ABET, Inc. (1998-2008). Accessed June 2008. <http://www.abet.org/>
- Computer. Def. 1. (2005). *Random House Unabridged Dictionary*. 0-375-40383-3, New York, NY



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In these 34 chapters, we survey the broad disciplines that loosely inhabit the study and practice of human-computer interaction. Our authors are passionate advocates of innovative applications, novel approaches, and modern advances in this exciting and developing field. It is our wish that the reader consider not only what our authors have written and the experimentation they have described, but also the examples they have set.

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