Proposal to the Program Review and Assessment Committee

1. **Name and rank/title of Project Director(s)**
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7. **Project Title:**
   Assessing One Core Course in Informatics:
   Establishing Competencies and Outcomes for Human-Computer Interaction 1 (I541)

8. **Project Dates**

Course Assessment Process:	Summer 2006
Re-Design and Re-Aligning of Two Courses:	Summer 2006
Application of revised course:	Fall 2006 (HCI 1) and Spring (HCI 2) 2007

9. **Project Checklist**

   X Statement of support from the department chair or school dean by e-mail to dperry@iupui.edu (from Dean Perry, Associate Dean for Graduate Studies and Research, School of Informatics)

   X Simple budget**:** Budget statement at the end.

   N/A IRB (Institutional Review Board) approval attachment by email or hard copy to esener@iupui.edu or (Erdogan Sener, ET –309 K , IUPUI) or project director statement that IRB representatives have been consulted and all requirements have been fulfilled sent to same. Disbursement of funds will be contingent on receipt of approval by the Institutional Review Board, if human subjects review is necessary.

PRAC Grant Proposal

Abstract

The purpose of the proposed study is to assure that the course HCI 1 (I541) aligns with three measures or frameworks of learning related to course content and student performance. HCI 1 currently has learning outcomes and objectives that need revision. The study will use three frameworks of HCI learning to determine to what degree: 1) course content has relevance, applicability, while meeting the standards of academic competency and 2) student performance matches those existing learning outcomes. Scoring rubrics will include course content (using the course text and project assignments) and student performance (using past course projects), which will be measured against the three frameworks of HCI learning.

Research Background

HCI Program

The Human-Computer Interaction (HCI) Graduate Program in the School of Informatics (SOI) began in the Fall 2003. Because of the interdisciplinary nature of informatics, the challenge of the HCI Graduate Program continues to support learning that leads students to understand that designing and testing interactive products requires drawing upon multiple knowledge domains to identify user experiences, and to enable this learning in the real-world. The HCI program began with two core courses (HCI 1 (I541) and HCI 2 (I542)) that apply directly to the discipline. In addition to other required core courses in SOI, these two courses are the gateway courses. As such, they are critical for establishing a solid foundation for a student's foreseeable academic and professional future in HCI. At this stage of the program, an assessment of the first course (HCI 1[1]) is necessary to establish appropriate criteria and standards for learning quality through an ongoing and systematic gathering and analysis of data. As suggested by Palomba and Banta (1999), assessment has a unique purpose, i.e., to improve student learning and development.

Pilot Study

In the Fall 2004, a pilot study (Faiola, 2005) measured HCI learning outcomes in regard to applicable skill-set development and how these skills were being applied at the students' current jobs. Multidisciplinary areas of theory and practice were used to measure the knowledge acquisition in the areas of design, business, computing, and social sciences. Three measures of central tendency showed a considerable application of HCI knowledge at their current jobs and the cross-respondent data for all questions showed similar increases from the current to future case. While most respondents acknowledged limited usage in their current jobs, they expected to see large increases in that usage as they move toward the end of the program and apply more of the newly learned skills in future positions in the real world.

Outcomes and Competencies Based on Three Frameworks of Learning in HCI

In the proposed study, outcomes and competencies for HCI 1 will be based on three existing frameworks of learning.

- Core Knowledge: A framework suggested by leading authorities in the HCI discipline at the SIGCHI 2005 Workshop on Graduate Education (SIGCHI-WGE), will be used as the most up-to-date criteria for HCI education. (See Appendix A.)
- Academic Competency: Undergraduate curricula at IUPUI should attain to the six PULs, but graduate programs might also take note of their relevance and guiding principles at levels of more rigor and depth. In the HCI Graduate Program the six PULs have served as a foundation and for the development of many of its courses. So, in like manner, the six PULs will also be used to benchmark HCI 1's degree of adherence.
- Professional Best Practice: The course HCI 1 draws upon a recently developed framework that reflects the authors own pedagogical research and knowledge; referred to as the Design Enterprise Model (DEM) for HCI learning (Faiola, in press; Faiola, 2005). Because informatics is an interdisciplinary program, a pedagogical framework such as DEM was critical for building and organizing HCI theories and practices into a unified system that could be considered in light of professional best practice. For this reason, DEM has 4 knowledge domains (1) social science, 2) design, 3) business, and 4) computing) that all fall under the categories of theory, practice, and also management. (See Appendix B.)

Reasons for Using the Three Frameworks of Learning to Measure the Outcomes and Competencies of HCI 1

The responsibility of developing and delivering the HCI curriculum at IUPUI demands three frameworks or standards of measure (Core Knowledge, Academic Competency, and Professional Best Practice). This is because student learning of core knowledge and academic competency has little meaning unless course content is also linked to professional benchmarks of best practice in the workplace. Because most HCI graduate students (IUPUI) work full-time in information technology, they currently are, and will continue to be, practitioners. As such, what students learn must be measured on multiple levels. In this way, both content relevance (to industry) and course teaching (core knowledge) should be measured and compared, while levels of intellectual competence (PULs), provide the necessary standards that the HCI graduate program also considers as important for success.

Proposed Study

Purpose

The purpose of the proposed study is to assure that HCI 1 (I541) aligns with three related measures or frameworks of learning relative to course content and student performance. The study will be done during the summer 2006, with the anticipation that a second study could be done at a later time for HCI 2. HCI 1 currently has learning outcomes and objectives (See Appendix C.) that need revision based on the findings of the proposed study. The study will use three frameworks of learning (SIGCHI-WGE, 6 PULs, and DEM) to determine: 1) that course content has relevance, applicability, while meeting the standards academic competency and 2) that student performance matches those existing learning outcomes. Scoring rubrics will include: 1) course content, using the course text and project assignments and 2) student performance, using past course midterm and final projects. Each of the two scoring rubrics will be measured (compared) against the three frameworks of HCI learning.

Research Questions

The proposed study is an in-depth assessment of learning outcomes and competencies for HCI 1 to provide evidence to determine if the following criteria are being met:

1. To what degree does (or what portions of) HCI 1 meet the criteria of core knowledge outlined by SIGCHI – WGE?
2. To what degree does HCI 1 meet or uphold the 6 PULs?
3. To what degree does HCI 1 draw upon DEM by providing relevance and applicability for students attempting to:
    a. Use what they learn in class at their current jobs?
    b. Consider the use of what is being learned at a future position in the HCI profession?

Methodology

Instrument: Based on the 3 main questions posed, three questionnaires will be devised to determine the degree of compliance with the three frameworks. Each questionnaire will provide questions that specifically address both course content and student performance against the three frameworks of learning. (See Table 1.) A learning outcomes matrix will be created that compares the two rubric scores against the three frameworks, from which the data will be analyzed for concordance, redundancy, complementation, and relevance. Each scoring rubric as 5 levels of compliance (0-4).

Analysis: The analysis process will include a systematic tabulation and reporting of the data as relative frequencies. Finally, recommendations will be provided for changes to the existing learning outcomes and competencies for HCI 1, including suggestions related to the course text, and class midterm and final assignments.

Table 1. Testing Model of the Study with the Three Frameworks of Learning and the Two Assessment (Scoring) Rubrics

		3 HCI LEARNING FRAMEWORKS & ASSESSMENT RUBRICS		
Learning Frameworks		**SIGCHI – WGE** (Principles of HCI Grad Learning)	**6 PULs** (Principles of Undergrad Learning)	**DEM** (Knowledge Operators and Domains)
Dimension of Learning		**Core Knowledge**	**Academic Competency**	**Professional Best Practice**
Criteria Outcomes		1. Design 2. Technology 3. People 4. Values, ethics, social impacts 5. Studies of people and technology interaction	1. Core Communication and Quantitative Skills 2. Critical Thinking 3. Integration and Application of Knowledge 4. Intellectual Depth, Breadth, and Adaptiveness 5. Understanding Society and Culture 6. Values and Ethics	Operators: 1. Theory 2. Application 3. Management Domains: 1. Social 2. Design 3. Business 4. Computing
Scoring Rubrics:	**Course Content** (Using Course Text and Project Assignments)	**Content Assessment Rubrics:** 0 = No evidence 1 = Minimal evidence 2 = Partial evidence 3 = Emerging toward complete evidence 4 = Complete evidence		
	Student Performance (Using Course Projects)	**Performance Assessment Rubrics:** 0 = Novice 1 = Apprentice 2 = Proficient 3 = Developing toward distinguished 4 = Distinguished		

Evaluation & Dissemination
The outcomes of the study will be provided the Office of Graduate Studies in the IUPUI School of Informatics. Final results will be sent to the HCI faculty for final review. Implementation of the results of the proposed re-alignment for HCI 1 will be implemented in fall 2006 and further refined for fall 2007.

Outcomes of this project
This project will produce syllabi and new course materials specifically designed to better facilitate HCI master's students a better understand of the contents and principles outlined in the three frameworks.

Budget description
The budget will be used for a summer stipend for the grant participant: $2500. The applicant has spent the greater part of the last three summers preparing the existing courses, with no compensation. However, at this juncture of the HCI graduate program, a more intensive assessment is needed. This equates to approximately one months of effort in developing the rubrics and incorporating them into the program's assessment plan and new syllabus.

References

Faiola, A. (in press). The design enterprise: Rethinking the HCI education paradigm. *Design Issues.* MIT Press.

Faiola, A. (2005). The design enterprise: Rethinking the HCI education paradigm. In G. Salvendy and J. Jacko (Ed.), *Human-Computer Interaction - Ergonomics and User Interfaces, Theory and Practice, Volume 5 - Emergent Application Domains in HCI, Proceedings of the 11th International Conference on Human-Computer Interaction.* Las Vegas: Nevada. (Mahwah, NJ: Lawrence Erlbaum Publishers, CD-ROM).

Palomba, C. & Banta, T. (1999). Assessment Essentials: Planning, Implementing, and Improving Assessment in Higher Education. San Francisco: Jossey Bass.

[1] Course Description: This course covers human-computer interaction theory and application from an integrated-approach of knowledge domains, i.e., the cognitive, behavioral, and social aspects of users and user context, relevant to the design and usability testing of interactive systems.

Appendix A

Core HCI Knowledge for PhD Students During the First Two Years
CHI Workshop on HCI Graduate Education

(SIGCHI - Special Interest Group for Computer Human Interaction.)
Web: http://hcc.cc.gatech.edu/chi2005workshop.htm

Kellogg Booth, Alan Borning, Kerstin Eklundh, Jim Foley, Wanda Pratt (recorder),
Kari-Jouko Raiha, Judy Ramey, Barbara Wildemuth

Core Knowledge includes:

- **Design**
  - Theories
  - Practice
- **Technology**
  - Ability to converse intelligently with developers
  - Implies needs some experience in programming
  - Range of technologies that make a deployed app
  - Build/supervise development of a prototype for PhD
  - Pass "bluff test" (student can't be bluffed by a programmer)
  - Pragmatics
- **People**
  - Perception/motor - Perspectives from Kinesiology, psychology, ergonomics
  - Emotion/affect
  - Learning/developmental psychology
  - Cognition
  - Memory
  - Organizational dynamics
  - Small group behavior
  - Culture – talk with an ethnographer intelligently
- **Values, ethics, social impacts**
  - Values/Ethics/Social impacts
  - Professional ethics
  - Human subjects issues
  - Impacts of innovation
  - Integrating value considerations into HCI design and practice
  - (Un)expected consequences/emergent behavior
  - Theory & methods
- **Studies of people and technology interaction**
  - Rhetorical theory
  - Information behavior
  - Qualitative methods
  - Quantitative methods
  - Institutional barriers
  - Restrictions on graduate credit for senior-level courses in other departments
  - Long prerequisite chains
  - Financial
  - Enrollment restrictions (e.g. majors only courses)
  - Disciplinary barriers
  - Vocabulary differences
  - … and many others!

Appendix B

Table 1. *The Design Enterprise Model*

DEM is the result of two years of an extensive review of existing HCI Graduate Programs in the U.S. and Canada.

DEM		KNOWLEDGE DOMAINS			
		Social **(Human & Culture)**	Design **(Graphics & Interaction)**	Business **(Market Value & ROI)**	Computing **(Building & Testing)**
KNOWLEDGE OPERATORS	**I.** Theory **(Foundations)**	1. Cognitive psychology 2. Anthropology 3. Sociology & social informatics 4. Cross-cultural communication	1. Interface Design: Visual communication & information design 2. Interaction Design: Human-centered design theory (General theory of human action / behavior)	1. Local and global markets 2. Product and market value 3. Product business strategies 4. Return on investment (ROI)	1. System modeling and computing theory 2. Usability and HCI theory 3. Testing measures
	II. Application **(Processes)**	1. Contextual Profiling 2. Ethnography: • Observation • Interviews/questionnaires • Focus groups • Interpretation & Analysis 3. User Modeling: • Human need, • Diversity, • New social groups	1. Problem space development 2. Product requirements 3. Conceptual modeling: 4. Rapid Prototyping 5. Dynamic Prototyping 6. Design Iteration Tools 7. Participatory design, etc.	1. Apply business strategies • Create a better targeting of customer needs • Achieving market goals 2. Integrate market value & product design • Increase product value for the user • Increase economic value for the company	BUILDING TOOLS 1. Scripting / HTML 2. Flash / Director 3. Visual Basic 4. Other TESTING TOOLS 1. Usability Testing: • Time-on-task studies • Questionnaires / Surveys 2. Heuristic Inspections 3. Observation / Interviews
	III. Management **(Administrations)**	1. Coordinate assets within an interdisciplinary design team 2. Deploy existing skill-sets through cross-disciplinary dialogue 3. Facilitate communication that can profit all the stakeholders within the design enterprise. 4. Administer design processes to better guide teams in the documentation, organization, and sharing of information across knowledge domains.	1. Direct the prototype design process of user interfaces & other system components that account for: • Visual clarity and aesthetics • Utility, functionality, and usability 2. Manage the innovation/ creation process of new technologies that have portability with functionalities: • Wireless and distributed • Networked information utilities	1. Manage user and market research for a better understanding and application of business and design knowledge. 2. Create an effective business environment that reinforces the capability of accessing, exchanging, capturing and generating new knowledge within the design process.	1.Oversee product building and testing 2.Oversee quality control of product design and testing procedure 3.Oversee integration and summation of data analysis 4.Make final recommendations and prepare presentation.

Appendix C

Learning Outcomes

The learning outcomes of this course will include each graduate student acquiring the skill to

1) Explain terms and concepts related to the following range of HCI topics:
   - HCI basics, interaction design, and related areas
   - HCI conceptual models
   - Cognition and user profiling
   - User needs / requirements and product assessments
   - The processes / life-cycle of interaction design
   - Interface design and prototyping
   - Social mechanisms used in communication
   - A user-centered approach to interaction design
   - Product evaluation/testing methods
2) Design and evaluate the usability of interactive products up to the prototype stage by applying HCI principles and models. (See project description for more details.)

Learning Objectives

1. Related to obtaining knowledge about HCI:
   a. Students will explain, recognize, and apply with considerable depth:
      - HCI terms, principles, and conceptual models
      - Social mechanisms used in communication
      - A user-centered approach to interaction design
      - User profiling to interaction design
      - Interface design principles and processes
      - A user-centered approach to interaction design
      - Interface design principles and processes

   b. Students will
      - Analyze user needs and requirements
      - Create interface design and prototyping
      - Adapt specific product evaluation/testing methods
2. Related to product development, students will:
      - Produce interface designs and prototypes based on user assessments
      - Apply HCI principles and a user-centered approach to interaction design
      - Design two interactive products up to the prototype stage
      - Apply evaluation and usability testing methods to interactive products to validate design decisions