College of Architecture & Urban Studies (CAUS)
Industrial Design (ID), School of Architecture + Design (SAD)
   Akshay Sharma, MFA, Associate Professor; akshay@vt.edu
design and empowerment, sketching and visualization

Studio Art & Creative Technology (CT), School of Visual Art (SOVA)
   Carol Burch-Brown, MFA; Professor + Interim MFA Director; cbb@vt.edu
   sound, technology and art, interactive art
   Dane Webster, MFA; Associate Professor + MFA Director; webster@vt.edu
   3D, animation, interactivity

Visual Communication Design (VCD), School of Visual Art (SOVA)
   Troy Abel, MFA, PhD; Assistant Professor + Chair VCD; abel@vt.edu
   usability, eye-tracking, interaction design, design thinking + strategy, HCI
   Ben Hannam, MFA; Assistant Professor; bhannam@vt.edu
   design pedagogy, experiential learning, and visual communication

College of Engineering (COE)
Computer Science, (CS)
   Doug Bowman, PhD; Professor + Director CHCI; dbowman@vt.edu
   HCI, user interface design and evaluation
   Scott McCrickard, PhD; Associate Professor; mccricks@vt.edu
   HCI, usability engineering

Engineering Education (EE) + Industrial System Engineering (ISE)
   Aditya Johri, PhD; Assistant Professor; ajhori@vt.edu
   HCI for development, learning technologies, virtual collaboration

Mechanical Engineering (ME) + Engineering Education (EE)
   Christopher Williams, PhD; Assistant Professor; cbwill@vt.edu
   design for additive manufacturing, design pedagogy

College of Liberal Arts + Human Science (CLAHS)
Communication (COMM)
   Bart Wojdynski, PhD; Assistant Professor; wojdynski@vt.edu
   media and technology in communication studies

English (ENGL)
   Quinn Warnick, PhD; Assistant Professor; warnick@vt.edu
   information architecture, web development, content strategy

Learning Sciences & Technology (LST), School of Education (SOE)
   Michael A. Evans, PhD; Associate Professor; mae@vt.edu
   educational games & simulations, design-based research, learning sciences

Science and Technology in Society (STS)
   Matthew Wisnioski, PhD; Assistant Professor; mwisnios@vt.edu
   social studies of design, history of technology

Institute for Creativity, Art, & Technology (ICAT)
   Ben Knapp, PhD; Professor (CS) + Director ICAT; benknapp@vt.edu
   interaction design, creative technologies, social science
Introduction

In a shifting global economy, new societal challenges demand creative processes that stem from the insight that design, aesthetics, and technological development have become symbiotic. Because the research and execution of novel products and services to meet the individual and collective needs of clients as varied as multinational corporations and rural villagers has vexed experts in a range of fields, individuals from disparate professions—including artists, designers, educators, engineers, computer scientists, learning scientists, and technology specialists—are learning to work together to construct new design methods.

Human Centered Design (HCD) is an emerging design philosophy charged with understanding the processes and methodologies in which the needs, wants, and limitations of end-users are integrated at every stage of the design process. HCD can be characterized as a multi-stage process of problem definition and solution that not only requires designers to analyze and foresee how users are likely to use a product, but also to test the validity of their assumptions with regards to user behavior in real world tests with actual users.

HCD creates novel learning and discovery opportunities that are needed to train the future professoriate, workforce, and professional / civic leaders. HCD, however, can only be taught in a true interdisciplinary educational environment in which coursework and research embrace diversity, inclusiveness, educational breadth, and interdependence, while promoting a person-oriented, rather than a product-oriented, attitude towards education.

Virginia Tech offers the perfect academic environment to educate and prepare the innovators and educators of the future where art, design, education, engineering, human sciences, and technology converge. By cross-cutting and uniting multiple design disciplines, this proposed IGEP will provide students with interdisciplinary breadth that ignites creativity and collaboration, resulting in the education of innovators and educators of the future who are not limited by insulated thinking and action. We anticipate that graduates of the HCD/IGEP will enter the academy or obtain jobs in the high-tech industry (e.g., Microsoft, Boeing, IBM, Intel, Amazon, T-Mobile, Google) as user interface designers, software developers, user experience researchers and designers, or strategists in other forms of human-centered communication.

By immersing participants in design, education, engineering, the human sciences, and technology, the HCD/IGEP will provide an environment of discovery that instantiates trans-disciplinary problem based learning (PBL) as well as exploration in the creative process and design thinking. Students will be exposed to a new paradigm of education and research that follows the outputs of their efforts in research and design, to the very point of societal engagement. We put people first and research and design interactions between humans and technology. Through our work students and faculty of the HCD/IGEP program will advance design knowledge guided by the desire to change the world.

Education Goals

We propose both a PhD program and a graduate certificate in a curriculum that combines technical expertise with critical inquiry to develop reflective practitioners equipped to meet vital human needs.

The HCD/IGEP degree is build around competencies in four core areas: (1) Creative Problem Solving, (2) Computational Practices, (3) Interdisciplinary Research, and (4) Humane Understanding. Students must select at least one course from each area to complete this core requirement (See Figure 1 & Table 1). Coursework consists of twelve credits in CORE augmented by twelve credits selected from CORE/1-4 as determined by the student and major professor. Additionally, completion of the twelve CORE credits will result in a Graduate Certificate of PhD’s in other major areas of study.
Core/1: Creative Problem Solving. The Project / Problem based education model currently used in art & design studio environments has become the gold standard for preparing participants in multidisciplinary teams, a methodology that mirrors what our graduates can now expect to encounter after graduation. This core requirement presents design skills, design-oriented thinking, and design practices by maintaining a strong focus on experimentation, reflection, iteration, and imagination.

Core/2: Computational Practices. Exposure to Computer Science & the Learning Sciences is essential to the HCD student and will engage students in computational thinking, to understand the design and evaluation of interactive systems, and to use programming environments and prototyping tools in the development of such systems.

Core/3: Interdisciplinary Research. This core requirement will introduce students to professional and interpersonal approaches to cross-cutting interdisciplinary research methodologies. Courses in this Core/3 will be team-taught by at least two participating faculty, building from a precedent established by the Graduate School.

Core/4: Humane Understanding. Harnessing the Science and Technology in Society (STS) department, which draws on the full range of disciplines in the social sciences and humanities, students examine the ways in which science and technology shape, and are shaped by, our society, politics, and culture. This core area asks, “what does it mean to be human in a world mediated by science and technology?” The addition of a Learning Sciences perspective will add, “what does it mean to know and act in a mediated, networked world?” Remaining credits will be selected from across the participating departments, which augment the students identified focus within Human Centered Design, as well as the necessary required dissertation research credits.

Table 1: Example coursework satisfying the four core areas of the HCD/IGEP

<table>
<thead>
<tr>
<th>Core</th>
<th>Course #</th>
<th>Course Title</th>
<th>Dept.</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ART 5XXX</td>
<td>Concepts, Theory + Methods of VCD</td>
<td>VCD</td>
<td>Submitted</td>
</tr>
<tr>
<td>1</td>
<td>ART 5XXX</td>
<td>TS: Topics in Human Centered Design</td>
<td>VCD</td>
<td>Submitted</td>
</tr>
<tr>
<td>1</td>
<td>IDS 5105</td>
<td>Critical Design Thinking</td>
<td>IDS</td>
<td>Existing</td>
</tr>
<tr>
<td>2</td>
<td>EDIT 5614</td>
<td>Digitally Mediated Learning</td>
<td>LST</td>
<td>Existing</td>
</tr>
<tr>
<td>2</td>
<td>EDIT 5624</td>
<td>Interactive Learning Media, Arts, and Design</td>
<td>LST</td>
<td>Existing</td>
</tr>
<tr>
<td>2</td>
<td>CS 5724</td>
<td>Models + Theories of Human Computer Interaction</td>
<td>CS</td>
<td>Existing</td>
</tr>
</tbody>
</table>
Interdisciplinary Graduate Education Program Proposal: Human Centered Design (HCD)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Department</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 5984</td>
<td>Interactive Computer Music &amp; Multimedia Design</td>
<td>MUSIC</td>
<td>Existing</td>
</tr>
<tr>
<td>CS 5774</td>
<td>User Interface Software</td>
<td>CS</td>
<td>Existing</td>
</tr>
<tr>
<td>ENGE 5984</td>
<td>Global and Virtual Work</td>
<td>ENGE</td>
<td>Existing</td>
</tr>
<tr>
<td>GRAD 5134</td>
<td>Topics in Interdisciplinary Research</td>
<td>GRAD</td>
<td>Existing</td>
</tr>
<tr>
<td>ENGE 5984</td>
<td>Ethnographic and Qualitative Research</td>
<td>ENGE</td>
<td>Existing</td>
</tr>
<tr>
<td>ITDS 5114</td>
<td>Advanced Design Research</td>
<td>ITDS</td>
<td>Existing</td>
</tr>
<tr>
<td>ENGL 6774</td>
<td>New Media Writing Workshop</td>
<td>ENGL</td>
<td>Existing</td>
</tr>
<tr>
<td>STS 6614</td>
<td>Interdisciplinary Cultures of Design</td>
<td>STS</td>
<td>Existing</td>
</tr>
<tr>
<td>EDIT 5154</td>
<td>Theoretical Found. of Tech-Enhanced Learning</td>
<td>LST</td>
<td>Submitted</td>
</tr>
<tr>
<td>ENGE 5XXX</td>
<td>Seminar in Learning Technologies</td>
<td>ENGE</td>
<td>New</td>
</tr>
</tbody>
</table>

Research Goals
A central research theme underlying the HCD/IGEP is “design thinking,” a concept and methodology that incorporates a plethora of innovative education and research activities all with a human-centered design ethos powered by observation, understanding and the needs of society.

While our participating faculty has varied research agendas, we share the following goals:

- Establish an interdisciplinary PhD degree that unites domain expertise across disciplines
- Establish several clear lines of collaborative research themes that can receive meaningful and sustained contributions from HCD faculty (See Table 3)
- Establish an HCD Collaborative to coordinate education, research, and outreach activities
- Leverage existing externally funded projects (See Table 3) (e.g., Evans-STEM, Bowman-ViGIR, Johri-EC) and seek new awards from agencies including the National Science Foundation, the Institute for Education Sciences, and DARPA.
- Explore the possibility of establishing a Corporate sponsored HCD Research Lab. (e.g. MIT Media lab, leverage relations with locally owned Modea)

This new domain of research, education, and development will challenge electrical and mechanical engineers and scientists, who previously could work independently, to innovate in a collaborative environment with artists and designers in a process of co-creation. However, in testament to the spirit of interdisciplinary research, the tables below are representational of currently funded, and anticipated, project proposals by HCD/IGEP participants.

Table 2: Selected funded project

<table>
<thead>
<tr>
<th>Project</th>
<th>Agency</th>
<th>Program</th>
<th>PI’s</th>
<th>Period</th>
<th>Funded</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAMES</td>
<td>NSF</td>
<td>DR-K12</td>
<td>Evans, Deater-Deckard, Anderson, Chang, Balci</td>
<td>2011-14</td>
<td>$1.9M</td>
</tr>
<tr>
<td>Studio STEM</td>
<td>NSF</td>
<td>ITEST</td>
<td>Evans, Jones, Brandt Schnittka</td>
<td>2011-14</td>
<td>$1.3M</td>
</tr>
<tr>
<td>Product Archeology</td>
<td>NSF</td>
<td>her</td>
<td>Williams, Paretti, McNair, Wisnioski</td>
<td>2012-14</td>
<td>$65,000</td>
</tr>
<tr>
<td>Exam/Create</td>
<td>NSF</td>
<td>HCC</td>
<td>Johri, Lohani, Tater</td>
<td>2009-12</td>
<td>$225,000</td>
</tr>
<tr>
<td>Team ViGIR</td>
<td>DARPA</td>
<td>Robotics</td>
<td>Bowman, Van Stryk, Conner</td>
<td>2012-13</td>
<td>$86,000</td>
</tr>
</tbody>
</table>

Table 3: Anticipated proposal under development

<table>
<thead>
<tr>
<th>Agency</th>
<th>RFP/RFA Area</th>
<th>PI’s</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF</td>
<td>Human Centered Computing 1</td>
<td>McCrickard/Abel</td>
<td>January 2013</td>
</tr>
<tr>
<td>NSF</td>
<td>Cyberlearning</td>
<td>Abel/Evans</td>
<td>February 2013</td>
</tr>
</tbody>
</table>
Sustainability Goals

*Immediate*: The PI’s of this proposal plan on resubmitting an IGERT proposal to NSF, which leverages the themes of this IGEP. If funded, the IGERT will allow for an additional 5 years of funding for the HCD IGEP program to flourish.

*Midterm*: The PIs plan to leverage a dual-degree option between SOVA’s M.F.A. (terminal) in Creative Technology with the PhD created by this HCD/IGEP. Fewer than 10 individuals across the United States currently hold these combined credentials (PI Abel is one of them).

*Long-term*: Become a national and internationally recognized program in Human Centered Design with our point of difference being the fusion between design, engineering, education, the human sciences, and technology as well as a dual MFA/PhD degree.

Recruitment & Retention

Recruiting will begin Spring 2013 and commence with the creation of a website detailing the program, faculty, and courses. We will then leverage social media and launch campaigns with LinkedIn, Facebook, Twitter, etc. to publicize our new program by directing prospective students to the website (www.vthcd.com). We will enhance this effort by recruiting from existing undergraduate programs in relevant disciplines at Virginia Tech and peer institutions. Several agencies and foundations (NSF, NASA, DoD, Spencer, IES, MacArthur) provide funding for doctoral candidates, and we will encourage our students to compete for these grants and fellowships.

Commitment to Growth and Sustainability

We intend to reach a steady state of at least 3 graduate students enrolling annually in the HCD IGEP program with n=10 average by the close of year 3. As previously discussed the PIs of this proposal intend to resubmit to NSF an IGERT that aligns with the goals of this proposal. If funded, this IGERT provides five additional years of funding. At the conclusion of year 3, the program will undergo assessment and degree reflection.

The PIs are extremely confident this degree will attract students. Market data indicates a sharp increase over the next several years, in the need of HCD educated individuals. An on-line search conducted on November 10, 2012, at careerbuilder.com using the keywords “human centered design,” resulted in 2,941 jobs returned. Graduates of the HCD/IGEP could easily fill any of these positions.

Assessment + Benchmarks

Student and HDC/IGEP success will be measured by observing several criteria: Maintenance of a GPA of 3.0 or better; Successful completion of the preliminary examination; Submission, acceptance, and presentation of at least one research paper or scholarly exhibit; Submission and acceptance of at least one scholarly publication; Satisfactory evaluation of work related to graduate assistantship responsibilities; and Successful completion, defense, and submission of the dissertation.

Additionally, the PI’s plan to implement Virginia Tech’s Academic Quality and Improvement (AQI) model. AQI provides a comprehensive analysis based on program-wide conversations with faculty and students addressing nine areas of quality: student learning; research, creative activity and scholarly work; outreach and engagement; stakeholder needs; students; faculty; key resources; diversity and inclusion; and measuring effectiveness and planning improvement.
Appendix: Example Student Agency

Several of the faculty participants of this HCD/IGEP currently attract interested graduate students in their respective fields of study. This HCD/IGEP will attract professionals from various fields who wish to develop their research and design thinking skills. Some wish to shift into academia, while others wish to scale the organizations ranks. Three example students are discussed below.

<table>
<thead>
<tr>
<th>Core + HCD Foci</th>
<th>Example HCD Foci Courses</th>
<th>Job Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Core/1: ART 5XXX Applied Studio in HCD</td>
<td>Professor- Research VP Human Centered Experience Research</td>
</tr>
<tr>
<td></td>
<td>Core/2: CS 5724 Models / Theories of HCI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/3: GRAD 5134 Interdisciplinary Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/3: ENGE 5984 Ethnographic and Qualitative Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/1: ART 5XXX Applied Studio in HCD</td>
<td>Professor- Design User Experience Design Design Strategists</td>
</tr>
<tr>
<td>B</td>
<td>Core/1: ART 5XXX Topics in HCI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/1: IDS 5105 Critical Design Thinking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/2: ENGE 5984 Ethnographic and Qualitative Research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/2: EDIT 5624 Interactive Learning Media, Arts, and Design</td>
<td>Human Factors + Design Engineer</td>
</tr>
<tr>
<td></td>
<td>Core/2: EDIT 5614 Digitally Mediated Learning</td>
<td>Behavior Shaping</td>
</tr>
<tr>
<td></td>
<td>Core/2: CS 5714 Usability Engineering</td>
<td>Social Media Scholar</td>
</tr>
<tr>
<td></td>
<td>Core/4: STS 6614 Interdisciplinary Design Cultures</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Core/1: ART 5XXX Applied Studio in HCD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/1: ART 5XXX Topics in HCI</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Core/2: EDIT 5624 Interactive Learning Media, Arts, and Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/2: EDIT 5614 Digitally Mediated Learning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/2: CS 5714 Usability Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Core/4: STS 6614 Interdisciplinary Design Cultures</td>
<td></td>
</tr>
</tbody>
</table>

Example Student Program of Study A

Student A comes to the HCD/IGEP PhD with a MA in Learning Technologies. They desire a HCD program with an emphasis placed on user-research, methods and theory. Ultimately they wish to become a professor at a research institution with a focused research agenda in HCI.

Example Student Program of Study B

Student B brings an MFA in Visual Communication Design to Virginia Tech. They wish to concentrate on creative problem solving, design thinking, interface design, and user experience research/design. Upon completion, they desire to enter industry as a VP of User Experience or Human Factors.

Example Student Program of Study C

Student C arrives to Virginia Tech with an MS in Cognitive Science. Through the HCD/IGEP PhD program they are able to pursue a course of studies that allows them to research and develop distributed learning systems along with serious games deployed by youth organizations to promote social change. Possible job opportunities include postdoctoral residencies at industry and academic research collectives investigating the adoption of social and entertainment media in networked publics.
November 9, 2012

TO: Karen P. DePauw, Vice president and Dean of Graduate School

FROM:
Primary Investigator: Troy Abel, Assistant Professor, Visual Communication Design (SOVA)
Co-Investigator: Michael, Evans, Associate Professor, School of Education
Co-Investigator: Matthew Wisnioski, Assistant Professor, Science, Technology and Society

RE: Interdisciplinary Graduate Education Program in Human Centered Design (HCD)

Dear Dean DePauw,
We fully support the proposed Interdisciplinary Graduate Education Program in Human Centered Design. This proposal is submitted by a team of cross-cutting, interdisciplinary, collaborating group of faculty from three colleges and eight Departments/Schools. No additional college/department resources are required to offer this program.

The Colleges/Schools/Departments of:

Jack Davis, Dean, CAUS
Barbara Ryder, Head, Computer Science

Kevin Concannon, Director, SOVA
Stephanie Adams, Head, Engineering Education
November 12, 2012

Karen P. DePauw, Vice president and Dean of Graduate School
Graduate Life Center at Donaldson Brown
Virginia Tech
Blacksburg, Virginia 24061

Dear Dean DePauw,

The College of Liberal Arts and Human Sciences and the Department of Science and Technology in Society fully support the proposed Interdisciplinary Graduate Education Program in Human Centered Design (HCD). The participation of assistant professor Matthew Wisnioski as a co-PI on this project assures that cultural, historical, and social perspectives will be at the core of the new program. No additional college/department resources are required to offer this program.

Sincerely,

Sue Ott Rowlands
Dean, CI AHS

Ellsworth (Skip) Fuhrman
Professor and Chair, Department of Science and Technology in Society
November 12, 2012

Karen DePauw
Vice President & Dean
Graduate School
Virginia Tech
Blacksburg, VA 24061

Dear Dr. DePauw:

With this letter I confirm the support of the School of Education and the College of Liberal Arts and Human Sciences for your proposed Human Centered Design IGEP.

I am pleased that SOE Associate Professor Michael Evans has agreed to be Co-P.I. and faculty of this innovative interdisciplinary program. His research currently cuts across several disciplines and he collaborates with several scholars and researchers across campus. This IGEP will solidify and reinforce these already strong relationships.

I further understand that this program provides potential Graduate Assistantship opportunities for graduate students in the School of Education, should they choose to affiliate with the Human Centered Design IGEP.

I have great confidence in the scholars involved with this proposal. They truly represent the high caliber of scholarship, research, education, and outreach that our institution should strive to support, nurture, and engage. We trust that you will find this IGEP proposal to be as worthy as we do.

Sincerely,

Joan B. Hirt
Interim Director, School of Education
Interim Associate Dean for Professional Education

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution
November 12, 2012

Dear Dean DePauw,

I am writing to express my strong support for the IGEP proposal on Human-Centered Design (HCD), led by Troy Abel. The Center for Human-Computer Interaction (CHCI) fully endorses this proposal.

As you are well aware, design is one of the foundational elements that influences our experience of the world and the products, services, and media we use every day. Nearly all of the artifacts we encounter—cars, phones, televisions, desk chairs, signage, and even mundane things like door handles—have been designed by someone, and that design has a profound effect on the usability, usefulness, and pleasure of using those artifacts. But design is a notoriously difficult thing to get a handle on, because it is inherently interdisciplinary. To successfully design a smart phone app, one needs knowledge of computer networking, programming, computer engineering, user interfaces, cognitive and perceptual psychology, sociology, and visual and sound design, just to name a few. But beyond that, the designer needs intuition about how everything will work together, the ability to draw from and talk about all these disciplines, and experience working in an interdisciplinary team.

The proposed IGEP in Human-Centered Design will give students exactly these sorts of skills and experiences, so sought after in both industry and academia, by having a truly interdisciplinary makeup. It will be similar to and even go beyond highly successful programs at our peer institutions, such as the Human-Centered Computing degree at Georgia Tech, or the Ph.D. programs in Human-Computer Interaction at Carnegie Mellon and Iowa State. Many of the students I currently advise would benefit greatly from this program. More importantly, the program should be highly attractive to new students, as it will be an offering unlike anything else in Virginia, and will be led by a respected and prominent team. I believe that the HCD program will also make Virginia Tech competitive for federal graduate education funding, such as the NSF IGERT, and will improve our already excellent opportunities for federal research funding.

In summary, the Center for Human-Computer Interaction is very pleased to participate in the HCD IGEP, and I give it my strongest support.

Sincerely,

[Signature]

Doug A. Bowman
Director, Center for Human-Computer Interaction
Professor, Computer Science

A Land-Grant University – Putting Knowledge to Work
An Equal Opportunity/Affirmative Action Institution