Work in Progress – Computer Science Perspectives on Integration with Human-Centered Design

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Abstract - **Capstone courses in many disciplines often fall into a single paradigm: they allow students to practice the skills they should have gathered through their progress in the department curriculum in a real-world or near-real venue. However, these courses often fail the real-world test by one important factor: they are not interdisciplinary projects, which is not indicative of industry experiences. We are attempting to create an interdisciplinary environment for capstone courses, involving both design and computer science students, to more adequately prepare students for industry work. This work-in-progress paper describes our experiences and plans for bettering the interdisciplinary capstone experience. The experiences show that there is a fundamental miscommunication between students of different disciplines that hinders their ability to collaborate. By analyzing qualitative questionnaires from 33 computer science students, we have affirmed the existence of this rift in inter-departmental understanding. This realization has formed our basis for creating educational modules to ease the collaboration between computer science and design students.**

Index Terms - Capstone courses, Design integration, Interdisciplinary education, Software engineering

INTRODUCTION

In 2004, an undergraduate class in the Department of Design was presented with a problem statement saying, "A mobile, ubiquitous computing device and supporting environment is to be developed for the next generation. The device must be designed for personal as well as business use. It must be accepted by its users and hence must be easily usable by them." The concept that emerged from this class was truly insightful: the device would simultaneously be both a trusted proxy for its user and a secure channel of desired digital content from any accessible source. However, the student designers were completely unaware of non-functional requirements, such as interfacing with existing business systems and creating a product that is innovative, yet realizable.

"Making things work" and non-functional requirements have typically been the domain of engineers. However, we doubt that a software engineering class presented with the same problem statement would have produced as insightful a final concept as that of the design class.

Specialization causes industry teams to be highly interdisciplinary. However, the reality of education is that graduates are not prepared to effectively work in interdisciplinary teams without some additional training upon entering the workplace. There have been calls for education to address this noticeable lack [1]. This resulted in efforts to incorporate interdisciplinary study into program curricula [2].

However, there seems to be a rift in understanding between computer science students and design students. Given the ubiquitous nature of "design", the word carries distinct meanings to students in different programs. We believe that these distinct meanings formed a fundamental misunderstanding on the role of design experts, which ultimately caused our interdisciplinary efforts to have a poor start. This work-in-progress paper will discuss our preliminary efforts to identify the root of the problem and our plans to address it in the future.

STUDENT QUESTIONNAIRES

In order to determine the understanding of design from the perspective of computer science students, we placed two design graduate students in two computer science capstone courses. These students were to act in a consultant role for the groups in the capstone classes.

As part of this experiment, the design students issued two questionnaires to the 33 undergraduate and graduate computer science students enrolled in the courses. The questionnaires were distributed to the students throughout the quarter.

The first questionnaire, distributed during the fifth week of the quarter, consisted of two different types of open-ended questions. Some questions regarded the meaning of the word "design", both in general and in the students' domain. Others asked the students to describe their perception of the designer skill set.

The second questionnaire, distributed in week nine, was different from the first. The first questions were again asking students for their definition of the word "design", both in general and within their own discipline. The second set of questions dealt with what benefits the designers brought to the project work and how those benefits affected the students' willingness to work with a designer in the future.

These questionnaires yielded entirely qualitative data. Our goal for issuing the questionnaires was to validate our assumption that computer science students view designers as people who merely improve the aesthetic quality of an

application and who are not experts in any other aspect of software creation. By validating this assumption, we ensured that any further research would be addressing a real problem instead of one fabricated by casual talk and articles in popular media.

RESULTS AND DISCUSSION

Through preliminary analysis of the questionnaires, we were able to validate our assumption that there is a high level of misunderstanding between students in the two departments. When asked to describe design in general, 47% of the students answered "look and feel" or "interface design", and 52% answered "usability". However, when asked to describe design within the context of software engineering, these types of responses dropped to 38% and 25% respectively; terms like architecture and software design (both 38%) rose in prevalence.

These preliminary questionnaires seem to point to a narrowing of vision among computer science students with regards to design. We believe the lack of interdisciplinary educational experiences blinds students to the expertise of their colleagues from differing fields.

However, this apparent blindness may be an expression of a different problem. Schlimmer, Fletcher, and Hermens noted that business executives say fresh graduates "often have unteachable attitudes" [3]. This is partly due to overconfidence on the part of the students. Whether or not this is an expression of that overconfidence, or if it is the lack of interdisciplinary educational experiences, it will inevitably delay their impact in their first industry jobs, thus slowing their growth once out of the classroom environment.

FUTURE WORK

By analyzing the student questionnaires, we realized that there is a disparity in the understanding of expertise between disciplines. Computer science students believe that designers are only there to improve the visual aesthetics of software. Design students are not aware of the process-driven nature of software engineers. To combat these gaps in knowledge, we will develop a set of educational literature aimed at improving interdisciplinary understanding.

Despite the misunderstandings between fields, we have noted large areas of overlap in the skill sets of students in each discipline. In order to increase awareness of this overlap, we will take a two-fold approach. First, we will conduct an evaluation of generic skill sets of each discipline and integrate the results with the previously mentioned educational materials. Second, we will design classroom situations to expose this overlap in skill sets. These will take the form of learning activities and mini-lectures.

We also plan to create case studies to help bridge the gap between design students and computer science students. Due to our National Science Foundation Industry-University Collaborative Research Center (NSF-IUCRC), we have extensive experience working with industry on contracted projects. From these interactions, we will develop case studies that showcase interactions between designers and software engineers.

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