Learning What You Need to Know:
Using a Common Book as a Fulcrum for Shared Experiences among Diverse Populations

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ABSTRACT

This paper describes our efforts at designing and evaluating a shared research experience for undergraduate students centered on a common book. We present an approach and analysis centered on the use of a common book in an undergraduate research experience, including choosing a book, crafting activities (both inside and outside the classroom) around book readings, and evidence of the effectiveness of the methods in selection and use. The experiences highlight the value to educators seeking to include a common book as part of a research course or experience—but also value for anyone seeking to use a common book as an integral part of teaching efforts. We present our initial efforts at moving from a co-located to a distributed experience through the use of Facebook, Google Groups, and other technologies.

1. INTRODUCTION

This paper describes our efforts at designing and evaluating a shared research experience for undergraduate students centered on a common book. The undergraduate participants in our research program—with recruiting targeted at members of underrepresented groups—have very different levels of knowledge and different goals coming into the program. We seek to address these problems I part by centering learning experiences on a *common book*, a short and appealing manuscript to be provided to all students within a certain demographic. Common books have been adopted by universities and colleges as a way to encourage a sense of community and togetherness among members of the student population. Selection of the common book generally takes place at a high level within the university by a large and diverse committee—with the mandate to use the book passed on to the professors teaching the students. Suggested methods for utilizing a common book include creation of discussion groups around book topics, in-class reference to select sections or quotations, and an invitation of relevant speakers on the book to class—generally methods that are not enforced (and graded) by a professor but have potential to broaden the understanding of the students through a shared experience.

In a survey of 130 administrators of common book programs, the top three goals in adopting common books were developing community outside of the classroom, fostering intellectual engagement, and encouraging a breadth of reading toward understanding diverse perspectives [14]. As these goals seemed highly relevant for the domain of research, we hypothesize that a common book, included as an integral part of a research experience, could help students experience a research program that is both engaging and rewarding.

This paper describes our efforts in using a common book in undergraduate research experiences. We describe the methods used to choose a book, activities (both inside and outside the classroom) designed around book readings, and empirical and anecdotal evidence of the effectiveness of our methods. We expect that our experiences will be of the most value to educators seeking to include a common book as part of a research course or experience—but we see value for anyone seeking to use a common book as a central part of teaching efforts.

Primarily, our data come from experiences with summer undergraduate students at Virginia Tech, funded by National Science Foundation (NSF) Research Experience for Undergraduates (REU) and Broadening Participation in Computing (BPC) grants to undertake an eight-week research effort in the area of human-computer interaction (HCI). We have administered this program for three summers and, in each instance, purchased the common book(s) and made reading the text(s) integral to their weekly activities. We also have experience using Virginia Tech's campus-wide common book in our classes, and some experience with common book endeavors at our previous universities.

Current efforts seek to move the common book experience from a co-located to a distributed experience—with 3-6 person groups of undergrads, grad students, and faculty at multiple university campuses seeking mentorship and research connections. The conclusions of this paper speculate about ways that the distributed experience can benefit from collaboration technologies (e.g., Facebook, Google Groups, and blogs/co-webs) to help to replicate the positive experiences from our common book experience, and to mitigate the negative experiences.

2. CHOOSING A COMMON BOOK

Guidelines for choosing a common book generally center on issues like readability, low cost, potential for student engagement, relevance and appeal to target student populations, richness of content, and connection to college initiatives [6]. These guidelines, and others like them, have relevance to our more focused target group—but the guidelines we found typically focus on university-wide common book programs for incoming freshmen. We seek to establish four categories for these themes that are particularly relevant to computing and HCI disciplines—current events, group demographic, task, and topic—and to provide examples of books in each category.

This does not represent a complete list of themes, but rather ones particularly relevant in the selection of books for our program. None of these themes are mutually exclusive; in fact, common book selections often draw from many if not all of these themes. However, the themes tended to recur from year to year, and we noted them in common book selections for our university and for other colleges and universities—suggesting the potential for utility by others considering the use of a common book.

A **current events theme** leverages highly-visible books, authors, and events, toward increasing relevance and appeal for the student readers. Students can connect events that they see on television, on the Internet, or in other media to elements of the book—providing a continuing reminder of the relevance of the book. Providing opportunities in public forums for students to bring up connections that they find between book topics and current events stories can further encourage reading and meaningful interaction around topics from the book.

An example of a common book with a current events theme is Randy Pausch's *The Last Lecture* [9]. Pausch, recipient of the 2008 SIGCSE Outstanding Educator Award, gave a "last lecture" talk at his home institution of CMU and wrote a book titled *The Last Lecture* after receiving a diagnosis of terminal pancreatic cancer. His talk, posted on YouTube, has been viewed over seven million times, his book spent months at or near the top of bestseller lists, and he appeared on widely-viewed news and talk shows. The visibility of this book and author exemplifies benefits of the current events theme: there is a level of familiarity that can be leveraged in the student activities. Other examples of books in this theme that we have used or considered are Steven Casey's *Atomic Chef* and Henry Petroski's *To Engineer is Human*—both aggregates of news stories that highlight how technological innovations can have tragic results when designers fail to consider the possibility for human error [3,11].

The **group demographic theme** involves identifying qualities and characteristics of the target demographic for the common book, then choosing a book that is particularly appealing or relevant to that demographic. Often the challenge in choosing such a book is in ensuring adequate appeal to administrators, professors, parents, and others who are expected to encourage the reading and use of the book.

An example of a common book with a group demographic theme is Quart's *Branded* [Quart]). Quart's book, chosen at Virginia Tech to be the common book for all incoming freshmen, examines how advertisers target teenagers toward maximizing profits. Faculty were able to connect to class topics related to commercialism, psychology of consumers, and roles of technology in advertising and gaming. Other examples include Pollan's *The Omnivore's Dilemma* comparing origins of meals from McDonald's chicken nuggets to organic chicken, and Lightman's *Einstein's Dreams* thought experiment as to what Einstein as a young scholar may have thought and dreamt [7].

A **task theme** informs the readers about a common task all will be seeking to accomplish; for example, undertaking a research effort, pursuing a college degree, or writing a professional paper. Generally filled with anecdotes about the common task, these books provide examples and inspiration for the readers. Care must be taken to avoid choosing a book that is not too much like a traditional textbook—one that still holds "fun" appeal for readers.

Examples of common books with a task theme are Booth's *The Craft of Research* and Peters' *Getting What You Came For* [1,10]. Booth's book examines the task of research from a writing perspective, providing tips, techniques, and anecdotes that can help guide a novice researcher (or even a more experienced one!) toward writing a research paper. Peters' book provides guidelines and examples of students overcoming obstacles in considering, applying for, undertaking, and succeeding in an academic career.

A **topical theme** focuses on the topic that will engage the students—in our case, the broad research area of human-computer interaction (HCI) that was the focus of our summer program. Students engaged in the program presumably have already demonstrated an interest in the topic, and an appropriate book can provide an alternate view of the field—or a historical view that may be obfuscated by traditional textbooks.

Examples of common books with a topical theme include Norman's *Design of Everyday Things* and Vicente's *The Human Factor* [8,15]. Both of these books provide interesting anecdotes about the field of HCI, balanced with the authors' perspectives on the nature of the field. Both authors are well known in the field, increasing the chances that the students will be reminded of the common reading when the authors' names appear in other situations.

3. CRAFTING COMMON BOOK ACTIVITIES

A common book is often intended to establish informal common talking points among students, creating opportunities for dialog and raising issues for deep thought. However, it seems naïve to expect that student-to-student dialogs will occur without intervention. We have identified means—both in formal classroom settings and through external activities—to engage students through activities related to a common book.

3.1 Classroom activities

Our goal in choosing and using a common book in our group meetings was to create highly interactive experiences for the students that would spill over into common book goals seen in other previously discussed programs—developing community outside of the classroom, to foster intellectual engagement, and to encourage a breadth of reading toward understanding diverse perspectives.

As is often the case with common books, there is no formal grading mechanism for our weekly classroom meeting. As such, we provide a brief recap of the readings for the day—but with lots

of embedded questions to highlight the need to do the reading. Perhaps most inspiring to students is the connection of concepts in the book to personal anecdotes—both from the discussion leader and from the students. This begins to foster creative and interactive thought that is essential in the next component of our weekly classroom activities.

Vital in encouraging engagement from students is the inclusion of interactive activities. An effective technique for inspiring this engagement is to turn around the arguments and techniques from readings and have them apply it to a common situation—or to another reading. For example, one activity asked students who were reading Vicente's *Human Factor* and Booth's *Craft of Research* to examine the ways that Vicente "crafted" his research—how well supported his ideas were, as judged by the writing guidelines described by Booth. Students noted that Vicente did not effectively argue his points according to the Booth guidelines (though they saw the Vicente book as having an audience that might not expect that level or style of writing).

Another common interactive activity is the application of concepts and ideas from the readings to the students' own research endeavors. When the students were learning about claims from Booth's *Craft of Research*, we encouraged them to think about how they had defended (successfully or unsuccessfully) a research claim of their own creation in the past week. When the students were reading Pausch's lessons about leadership, they were asked to consider how they demonstrated leadership in their scholarly pursuits. These opportunities not only provide for them the chance to reflect on their own recent successes, but also broaden the scope of their reading such that they consider how the lessons they are reading about might apply to their own endeavors.

A final notable component is the inclusion of other readings for the most interested students in the group—with thanks to Pausch for inspiring the idea throughout his book. A listing and brief description of additional reading materials not only provides opportunity for students to further pursue a topic, but also demonstrates both breadth and depth for the topic.

3.2 External activities

To differentiate research from the learning tasks to which our students were accustomed, we chose common books that focused on themes of creativity, innovation, leadership, overcoming mistakes, and thinking outside of the box. As such, we attempted to complement the readings with external activities with the same themes, of particular focus was creativity. The literature is replete with evidence that supports the need for creativity amongst engineers and computer scientist. As most technology and business pundits agree, the growing complexity of design problems commands more creativity and innovation in developing solutions. A recent study from the Council on Competitiveness [17], states that "creativity may be about fun and games, but it is also America's single greatest comparative advantage in an increasingly competitive global marketplace".

This is especially true in the development of interface technologies. It has been noted that technology, itself, is no longer the marketplace differentiator between products, but that the user interface (UI) is becoming the differentiator [9]. This is evidenced by the successes of such innovators as Apple and IDEO whose attention to UI design is renowned as world-class. As the premise of our summer experience is providing students the opportunity to design the UIs of emerging technologies, the criticality of inciting creativity and innovation in design is of extreme import.

Recognizing an opportunity to leverage the creative aspects of our common reading through a creative activity, we engaged Dr. Carole McNamee, a long-time computer science professor and founder of the Willowbank Creative Center, to develop a creative experience that explored classical approaches to design. Two approaches were selected, sketching and sculpting. Sketching was selected because it, as a tool, is a fundamental [2], yet often neglected in HCI [4], component of the design process. Similarly, sculpting was selected as there is increasing evidence of its efficacy in engendering an appreciation and understanding of the "physicality" of a design [18]. The overall goal of the creative experience was to bring relevance to creativity in design and incite creativity, though use of these approaches, amongst the students.

Facilitated by Dr. McNamee, the two-hour exercise entailed both freehand and facilitated sketching and sculpting sessions. In the sessions, participants were given germane themes (e.g., everyday objects and/or interactions) and were required to sketch or sculpt in response to the themes. The objective was to make the participants comfortable with the processes of sketching and sculpting and, through facilitated debriefing by Dr. McNamee, engage the participants on the relevancy of the processes in both "engendering" and "doing" creative UI design.

Evidence complied post-exercise revealed that many participants felt strongly about the applicability of the approaches in inciting creativity and innovation in their work. Many participants commented on how the approaches could facilitate working through a problem or solution space. Several participants especially enjoyed the activity as a means to foster a more "right-brain" approach to design. This was echoed by one 2006 participant who stated that "it was a great experience. It really opened me up and showed the connection between doing artwork and HCI."

We also noted enthusiasm by the participants with the exercise and observed use of the techniques by several of the participants. As highlighted by [14], there is importance of reinforcing ideas and approaches explored during the creative session. In support of this need, creativity, thematically as a design competency, was woven into the "common book" discussions in 2007 and 2008. Especially viewed as impactful were discussions in 2008 as the author of the common book, Randy Pausch, was a passionate advocate of creativity in the HCI discipline.

Other means of inciting creativity have also been investigated. In 2008, a complementary creative experience—cooking—was explored. Participants attended a cooking class at a local gourmet foods shop, The Gourmet Pantry. As the engagement in new experiences is often touted as a means to foster an openness to new ideas, concepts, and notions [5], the goal of this experience was to help participants begin to release, through active engagement, any creative barriers and develop an appreciation for, in general, differing and varied approaches. Participant reviews were mixed. Several participants commented on the relevancy of the activity—"It was so much fun! Not necessarily related to my research", stated a participant, "but good stress reliever and

bonding experience". Conversely, several participants expressed how the experience fostered an understanding of and receptiveness to differing viewpoints and perspective can enrich an outcome.

The planned renewal of this effort provides additional experiential treatments around creativity, with even tighter connections to the themes of the common readings. For activities like sketching and sculpting, connections to the lessons of innovation and thinking outside of the box from the readings of Pausch and Lightman—or potential contrasts with the structured view of creativity from Booth—would reinforce the lessons from the external activities and could incite further reflection and discussion among students.

4. ASSESSING THE IMPORTANCE OF A COMMON BOOK

Assessment of educational approaches is vital in creating a foundation that others can leverage. Much of the evaluation for common books relies on opinions of organizers based on their observations—and often it is only mildly positive [15]. As described previously in this paper, research like that from [15] and [6] exemplify the value that can be obtained through a common reading for freshmen students [6, 15]. This section presents our evaluation approach for benefits from common readings undertaken by more senior students—focusing on both empirical evidence and anecdotal evidence.

4.1 Empirical evidence

In an effort to understand the value that students place on a common book experience—particularly in comparison with other factors like the year of study and an annual research symposium—we administered several surveys and analyzed them for relevant influential factors. Each year, students were surveyed for their reactions and opinions on various events at four different periods of their summer experience. The Demographics survey requests background information of the summer students prior to orientation. The Post Orientation survey, administered following the orientation (one week into the summer program), measures their perceptions of check-in, the welcome meeting, talks such as GRE preparation and Institutional Review Board application, and tours on how to use various Virginia Tech resources. The Progress survey cognitively measures student progress and attitudes towards working with the research professor and graduate student mentors. The Post Summer survey measures student overall perception of all aspects of the summer program—most importantly, their interest to pursue HCI and other computing topics as part of furthering their educational career (i.e., performing more undergraduate research in HCI, taking more courses or extending one's reading in HCI, pursuing a career in HCI, or attending graduate school in HCI).

We applied an item response theory (IRT) model to measure how the summer experience gave our students an intellectually value-added experience. Variables such as the year of the summer program (which we will call YEAR), students' responses to participating in an end-of-summer research symposium (SYMP), and students' responses to the courses taken each summer (i.e. COURSES) were used to measure their likelihood of enhancing their interest in HCI (which we will name this response variable HCI_INT). We used a backward regression modeling technique,

logit, removing insignificant variables and reproducing a smaller model, toward categorizing explanatory and response variables. Phase 1 of the logit regression model included all three explanatory variables, concluding that all of the explanatory variable, with the exception of YEAR, were significant in measuring HCI. After Phase 2, the SYMP variable was not significant and was, thus, removed from the model. Finally, Phase 3 concluded that only the COURSES variables remained significant.

We found that students that reacted very positive (or very negative) toward taking the Monday meetings and participating in the research symposium have a higher (or lower) odds ratio of being classified as one who has a 'Very Strong' level of interest in HCI research versus an 'At Most Neutral' interest. We infer from this finding that these students understood the value of a research symposium where key personnel from the Center, the university, and local technology companies attended.

Following up on this result, we used a logit regression model once more to estimate the likelihood of our student participants pursuing graduate studies in HCI at Virginia Tech based on the YEAR, SYMP, and COURSES variables. The response variable, which we will call GRAD_STUD, was categorized where '2' represents those that are "Strongly" encouraged to pursue graduate studies in HCI, '1' represents those that are "Slightly to Moderately" encouraged, and '0' represents those students that are 'At Most Neutral'. We found the COURSES variable to be the only significant variable in predicting GRAD_STUD—students who had a positive experience in the weekly meetings were more likely to strongly desire to pursue research further. This suggests a need to focus even more on providing positive, inclusive, and interactive experiences during our Monday sessions, with close repetition and integration of the lessons related to creativity, technology, computing, and human-computer interaction.

As stated, features of the courses – particularly course discussions and activities – were strongly centered around the common book. This premise, coupled with the discussed findings, suggest that students experienced a higher interest in conducting research as well as an increased interest in pursuing graduate studies. As with any analysis of this type, a cautious reader realizes that the correlation does not necessarily imply cause-and-effect; as such, our follow-up work—both through additional surveys and through increased integration of program activities with the common book—will seek to understand the nature of the correlation.

4.2 Anecdotal evidence

Qualitatively, we emphasize participants' comments from each of three post-evaluations to address the importance of using two common books—Booth's *Craft of Research* (two years) and Pausch's *Last Lecture* (one year) [1, 9]. In 2006, one student noted that *Craft* "prepared me for the symposium" that concluded the summer program. This same student also noted that, at first, discussing one's progress in conducting research (as noted in textbook) was "pointless". However, after reflection of the entire summer program, the student realized "in the end [that student collaboration] helped a lot" in addressing the complications of producing quality work for the summer symposium. Moreover, several students have stated that *Craft* was the catalyst for the debates that took place in the classroom. They found that these

debates, centered on how to conduct research ethically, prevented this course from becoming mundane. The 2007 summer programs continued to use the Craft of Research to facilitate discussion on conducting research. Similar to 2006, common elements were found within the comments on this book. For example, one student noted that throughout the discussions, he or she realized that not everyone "was on the same page" when discussing their view of conducting research. Furthermore, it was noted that as learning the meaning of research and undergoing it concurrently is "a process" that continues to "unfold as you learn about it".

For *The Last Lecture* in 2008, several students emphasized a common idea that hearing about other researchers' experiences brought a clearer sense of the obstacles of conducting research. One student noted that making this text a required reading also requires the program to "provide more lessons" from other faculty members. Another student noted that he wished that he more time to "further understand the research process" conducted by his peers. Perhaps one student said it best by relating to current researchers' experiences as an "inspiration [that] can never be second-looked or undervalued".

In summary, the anecdotal evidence suggests that using a common book (1) encourages peer-to-peer debate on what our key topic of interest—research—really means to the students, (2) helps participants experience different viewpoints of research and processes in conducting it, and (3) encourages participants to gain more knowledge to network with other researchers. In return, the common book gives students a panoramic view of what it means to be called a "researcher".

5. CONCLUSIONS AND ONGOING WORK

This paper describes our efforts in using a common book in undergraduate research experiences, providing four themes for common books—current events, group demographic, task, and topic. We describe how a balance of activities inside and outside of the classroom can assist in the use of a common book, with examples for each. Empirical and anecdotal evidence shows value in our common book approaches. We expect that our experiences will be of the most value to educators seeking to include a common book as part of a research course or experience—but we see value for anyone seeking to use a common book as a central part of teaching efforts.

In moving forward, we are seeking to broaden the impact of our undergraduate research experiences by broadening our program, through meaningful inclusion of faculty mentors at the students' home universities, inclusion of gender-specific and race-specific mentors whose message is available more broadly, and lasting feedback so that students can asynchronously learn from others.

Specifically, our ongoing interventions include:

- A focus on a more permanent and less ephemeral communication among participants, toward encouraging meaningful interactions and lasting professional relationships. Specifically, we are using *Google Groups* to encourage collaboration among students—generally synchronously at a given university and asynchronously across universities. Online discussions center on sections of the common book, \common goals of a research experience, or reactions to a common video.

- Fostoring of both professional and social bonds between participants, shown to be particularly important for underrepresented groups. We seek to use *Facebook* to help create the social bonds—specifically by encouraging people to become "fans" of our group page. Most important in its use is in ensuring that several different people (initially program administrators, but later students or alumni of the program) are active participants, describing program activities, highlighting social events, and pointing to the more professional Google Groups pages and discussion.

- A *repository of peer-created YouTube videos* (most less than 10 minutes) provide insights from researchers ranging from current grad students to seasoned faculty members to panels on common experiences. Topics range from undertaking a job search to finding funding to attending conferences. These videos, often shown in sets of two or three, work well as starting points for group discussions.

- Use of *new evaluation approaches* to gain insight into the utility of our approaches. While traditional methods, like those described in this paper, provide some insight as to satisfaction, performance, and attitude, we speculate that many of these new technologies hold promise in reflecting the utility of the unique experiences of individuals, balance with shared gains of the group.

6. ACKNOWLEDGEMENTS

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