# Choosing and Using a Common Book in an Undergraduate Research Experience

D. Scott McCrickard[1], Woodrow Winchester[2], Marlow Lemons[3], and Robert Beaton[1]

[1] Department of Computer Science,
[2] Grado Department of Industrial and Systems Engineering,
[3] Department of Statistics,
Virginia Tech, Blacksburg VA 24061, USA
{mccricks,wwwinche,lemons,rbeaton}@vt.edu

**Abstract.** This paper describes efforts in using 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.

**Keywords:** computer science education, human factors, common book.

## 1 Introduction

Introduction of a *common book*, a short and appealing manuscript to be provided to all students within a certain demographic, has 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 graded but have potential to broaden student understanding through 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]—goals that seem relevant for our research-centered experience.

This paper describes our efforts in using a common book in multi-university 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

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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 and research efforts. Primarily, our data come from experiences with undergraduate students at an alliance of universities, funded by a National Science Foundation (NSF) Broadening Participation in Computing (BPC) alliance and an NSF Research Experience for Undergraduates (REU) grant. The alliance focused on building research skills and desires among undergraduate students. We administered this program for six years and, in each instance, made reading integral to their weekly activities.

## 2 Choosing a Common Book and Crafting Activities

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, or a mutually exclusive list, but rather ones relevant in the selection of books for our program.

A *current events* theme leverages highly-visible books, authors, and events, toward increasing relevance and appeal for the student readers. Examples include Randy Pausch's *The Last Lecture* [10], authored by a computing researcher after receiving a diagnosis of terminal pancreatic cancer, and Casey's *Atomic Chef* and 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 focuses on books that are appealing or relevant to certain characteristics of the target demographic. Examples include Quart's *Branded* [13], examining how advertisers target teenagers toward maximizing profits, and Lightman's *Einstein's Dreams* thought experiment a young Einstein's thoughts and dreams [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. Examples of common books with a task theme are Booth's *The Craft of Research* and Peters' *Getting What You Came For* [1,10]. A *topical* theme focuses on the topic that will engage the students—in our case, human-computer interaction (HCI) that was the focus of our program. Examples of common books with a topical theme include Norman's *Design of Everyday Things* and Vicente's *The Human Factor* [9,15].

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 has proven important to engage students—both in formal classroom settings and through external activities—through highly interactive activities related

to the common book. Generally, 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 that exercise their creative energies. An effective technique for inspiring this engagement is to turn around the arguments and techniques from readings and have them apply it creatively to a common situation—or to another reading. The importance of creativity is evidenced by the successes of such innovators as Apple and IDEO. Activities crafted from book themes often have a creative component of sketching, sculpting, or cooking, with connections to computing and research that can exercise creativity, connect design with engineering, and lead to richer learning experiences [2,4,5,8,14].

## 3 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 exemplifies 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 empirical evidence, anecdotal evidence, and post-program reflection from the first three years of our program.

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: a Demographics survey, a Post Orientation survey, a Progress survey, and a Post Summer survey. 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 book-centered 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.

Anecdotal qualitative evidence suggests that using a common book (1) encourages peer-to-peer debate on what our key program focus (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".

Online discussions with students who took part in the common book initiative revealed how the books shaped their careers. Three students took part in the discussions, all of whom are part of Ph.D. programs. All three recognized value in the books during the course of the program, and two still own the books. One acknowledged recommending it to others. Learning sessions that were more active (e.g., videos with discussions, relating to metaphors) stood out to the students. However, none have re-read the book since the initiative ended (though one noted an occasional desire to do so). It seems that the book was useful during the program and still sparks discussion, but none became favorites of the program participants.

## 4 Conclusions and Future 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 activities inside and outside of the classroom can assist in the use of a common book, with examples and support from empirical and anecdotal evidence. 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.

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