



A Tale of Two Common Reads: Models for Developing a Successful Common Reading Program for First Year Engineering Students

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I. Introduction and Background

Common reading programs offered at the start of the first year provide a valuable opportunity to model intellectual engagement among engineers, broaden students' thinking about the role of engineers in society and forge connections between first year students and the larger engineering community, including faculty. The purpose of a common reading program is "to provide a common academic experience for all first year students and to strengthen the academic atmosphere of the institution from the first day the student arrives on campus."^[1] Most programs involve the entire first year class reading the same book and participating in a guided discussion of 20 students or less. While many institutions offer university-wide common reading programs, primarily designed for liberal arts majors,^[2] few institutions have implemented a common read for engineering students. Common reading programs provide a valuable mechanism to set the stage early for educational goals that will be developed later in the engineering curriculum. University of Virginia-School of Engineering and Applied Science (UVa-SEAS) and the University of Michigan, College of Engineering offer successful engineering common reading programs, with 80% and 97% participation among first year students respectively. During the last twenty years, UVa-SEAS has developed best practices for designing and implementing common reading programs specifically for engineering students. Michigan Engineering outlines a recently developed program, designed in response to the changing demands placed on engineering graduates in the future, as illustrated by The Engineer of 2020^[3] and Educating the Engineer of 2020^[4] reports. Both reports illustrate the need for engineers who can effectively contribute to the changing landscape of the field through creativity, strong communication skills, an understanding of the principles of leadership and by becoming lifelong learners.^[3-4] The University of Michigan's program includes elements intended to specifically address these needs. We have also explored new models for scalability through a pilot program, including student-led larger group discussions of 50-100 participants.

In the following sections, we will offer strategies for the development of a successful common reading program for engineers, share findings of the scalability pilot and review common elements between these two successful programs.

II. Overview of UVa-SEAS Common Reading Experience, from 1993-2014

Program Background & Intended Outcomes

Within the Engineering School at the University of Virginia a Common Reading Experience program has been in place for over twenty years. In the early days (1998 – 1990), it was part of a University-wide program to facilitate interactions between students and faculty. When the University's program ended, the School of Engineering and Applied Science decided to run its own program and has done so since 1993.

One of the important goals of our Common Reading Experience program is to help forge connections between our students and the engineering faculty. The University of Virginia is a medium-sized research university with a fall 2014 enrollment of 14,898 in 2013-2014 undergraduates of which 2,589 are in the School of Engineering and Applied Science. Our faculty-student ratio is about 19, and students take several large enrollment courses in core topics their first year. In addition to promoting student-faculty interactions, the Common Reading Experience program has a number of other important goals:

- to provide an additional mechanism for students to get to know each other outside of class
- to help prepare students for the level of intellectual exchange expected at the college level
- to help students think about engineering outside its technical aspects (e.g., the important role of ethics, teamwork, etc.) and to foster the exchange of ideas and discussion with peers.

Book Selection Process

The selection process of the book has varied over the years, but has been driven by a committee of engineering faculty, staff from the Engineering library, and 2 representative from the Engineering student government. While the two co-authors from the University of Virginia have been asked to chair the committee for the past 7 years, other committee members volunteer to serve on the committee. The committee generally meets at the end of the fall semester to determine the nomination process mostly changing the level and mode of faculty engagement over the years. In the early days, the committee would generate a list of nominees and down select over several months and cycles of reading. In recent years, an email soliciting nominations from the school's faculty, staff, and students has been used to supplement this list. These additional nominations come from mostly faculty and students. Once an initial list of nominees is determined, the committee meets again to reduce the list to approximately 5-8 semi-finalists. At this point, committee members volunteer to read/skim several of the books. In general, we want to make sure that the books selected has a connection to engineering practice/profession, has multiple themes for the discussion (e.g. ethics, practice of the profession, personal development, impact of engineering on life), is not overly long, and has multiple themes for the discussion. As secondary criteria, the committee focusses on books that have been published recently, are timely in topic to recent events, and are available in paperback to reduce costs for students.

After reviewing the semi-finalists books, the committee reconvenes for discussion and selects 3-4 finalists. A ballot, including a description of the book and links to reviews, is prepared and sent to the school's faculty, staff, and students from their input. Generally, most of the input received is from current students. After voting has concluded, the committee reconvenes for the final book selection. Subsequently, emails are sent to the school announcing the selection and incoming students are notified about the book and the Common Reading Experience program.

Book Discussions

It has been our belief that small group discussions are best for our Common Reading Experience program. To facilitate this, recruiting of faculty leaders is critical. There is a particular

challenge in that participation in this program is not considered part of the service that a faculty member does; as a result, faculty who participate do this as an overload. Overall, we have had success, which we attribute to a general belief that this activity is important in terms of (a) the institution's distinctive residential culture and (b) the importance of faculty contact with students in terms of retention in engineering.

In addition to these two criteria listed above, we have found it advantageous to create a community amongst the faculty leaders. Over the past few years, this has been achieved by providing copies of the selected book and providing lunch to the group leaders the Friday before the discussions. During this meeting, we share ideas on how to lead a discussion about the book. These notes are collected and shared with all faculty group leaders, and this meeting is generally welcomed and generates significant guidance and input for the discussion group leaders.

Enrichment Events

As the program continues to evolve we are looking to connect the Common Reading Experience to courses taken by our incoming students. In 2014, the book selected was *Ingenious: A True Story of Invention, Automotive Daring and the Race to Revive America* by Jason Fagone. Through contacts within the faculty at UVa-SEAS we were able to invite the author to discuss the book and answer student questions in Science Technology and Society (STS) 1500: a course designed to strengthen writing and speaking skills and provide students with an introduction to the engineering profession, engineering ethics, and the social issues of professional engineering practice. A complete list of book selections from 1993-2014 is provided in Appendix A1.

Additional Recommendations

We believe that creating a Common Reading Experience for incoming students is valuable on a number of fronts. In terms of program design we believe that the following have been critical to our success:

- Having all meetings take place at the same time, the day before classes begin. While this does coincide with some Orientation events, which can reduce participation, we generally observe 75% to 80% participation among our incoming students.
- Keeping the groups small. While we strive for discussion groups of 20. Over the past few years, our average has been closer to 25 with an upper limit of the low 30s.
- Getting the faculty together before they lead the discussions.
- Involving the larger school community in the selection process. Added in the past few years, we feel that having input from different constituents, especially students, is critical to continue the experience.

In addition to the early interactions of faculty and students which a Common Reading Experience provides, other benefits include:

- An observation that students who do not participate in the Common Reading Experience group are more likely to run into academic difficulties in their first year. We now take attendance and are working to establish a statistically significant dataset to firmly support this observation for future advising strategies.

- Students get to meet each other intellectually. Orientation covers a number of important things for students to do. We believe that having a space for them to engage early academically helps in their transition to their studied at the University of Virginia.

III. Overview of the Michigan Engineering Common Reading Experience, from 2013-2014

Program Background & Intended Outcomes

The University of Michigan is a large research institution with 28,395 undergraduate students, of which 5,819 are enrolled in the College of Engineering. While some specialized programs within the university offer a common read for a small subset of students, the University of Michigan does not offer a university-wide common reading program. The Michigan Engineering Common Reading Experience engages the entire incoming class of first year engineering students, which is comprised of 1,300 students. The program is intended to model intellectual engagement and initiate the process of developing life-long learners through two programmatic goals:

- to create the feeling of a community of scholars, particularly among incoming engineering students
- to facilitate meaningful discussions regarding the role and responsibility of an engineer in society, as well as emphasize the importance of engineers developing competencies beyond the technical

The program has obtained high participation levels, with 97% of the first year students attending a book discussion in each of the first two years. At the end of each discussion, we facilitated a paper-based survey to evaluate the program and assess the intended outcomes. The evaluation was comprised of a combination of logistical questions, such as “Would you prefer an eBook or paperback copy of the book?” and assessment questions on a Likert-scale, provided below in Table 1. The complete list of questions is provided in Appendix A2.

Table 1. Assessment of intended program outcomes

Post-Discussion Survey Element	2014 response (N=1314)
Q1. Reading this book was valuable to me.	3.85
Q2. The book discussion was interesting and engaging.	3.68
Q3. The Common Reading Experience helped me connect with other Michigan Engineering students.	3.51
Q4. The Common Reading Experience helped me feel a stronger connection to the Michigan Engineering community.	3.47
Q5. I plan to attend additional events related to the Common Reading Experience during the academic year.	3.21
Q6. The Common Reading Experience should continue for future students.	3.81

Q7. I plan to leverage the experiences available across the University of Michigan campus to enhance my engineering education.	4.28
Q8. The Common Reading Experience helped me think in new ways about what it means to be an engineer.	3.97

*Average response, based on a Likert scale of (1) strongly disagree to (5) strongly agree

Book Selection Process

In the inaugural year of the program, the book was selected by a committee of faculty and staff. While engagement in the overall program and discussion groups was high, nearly half of the students recommended selecting a more engaging book. Subsequently, the 2014 book selection committee was comprised primarily of students. A small committee of faculty and staff reviewed the list of books suggested by the community (primarily students) and narrowed the selections down to eight books. Subsequently, 25 junior and senior students volunteered to read a minimum of two books and then participated in focus groups and an online evaluation process. As a result, 71% of the student participants in 2014 reported reading the entire book compared to only 39% in 2013. This indicates a potential connection between involving students in the selection process and student engagement throughout the reading process. Table 2 includes a comparison of perceived value of the book and interest in the discussion over the two years.

Table 2. Faculty-selected and student-selected book comparison.

Post-Discussion Survey Element	2013 - Faculty/Staff Selected Book* (N=1279)	2014 - Student Selected Book* (N=1314)
Q1. Reading the book was valuable to me.	3.29 ^{**}	3.83 ^{**}
Q2. The book discussion was interesting and engaging.	3.56 ^{***}	3.65 ^{***}

*Average response, based on a Likert scale of (1) strongly disagree to (5) strongly agree
Independent samples t-test: **p<0.001, ***p<0.01

During both years, we asked book selections readers to consider each book on a number of factors, including whether the book:

- Connects engineering practice and profession to wider intellectual themes
- Provides a lively and engaging read that appeals to students transitioning from high school to college (including literary quality and length)
- Creates the feeling of a community of scholars, particularly among incoming engineering students
- Provides the opportunity to facilitate meaningful discussions regarding the role and responsibility of an engineering society
- Emphasizes the importance of engineers developing competencies beyond the technical, specifically, the following: creativity & innovation, an entrepreneurial mindset, intercultural intelligence, social & environmental responsibility, effective communication and collaborative spirit

- Allows opportunity to foster discussions about social identity, as exploring social identity and expressly valuing diversity is an important aspect of community development.

Book Discussions

We held book discussions on campus in the evening, during the first two weeks of the Fall term. Volunteer student facilitators read the book in advance of discussion sessions and attended a two-hour facilitation training.

We intentionally divided first year students into discussion groups to maximize diversity across gender, ethnicity and citizenship. We sent each student an email communication assigning them to a specific discussion group and time. We did not take into consideration individual student schedules. Therefore, we provided students the option register for a new time by completing an online form. Students who missed their assigned discussion, but did not register for a new time, received an email every three days, until they re-registered. While students were informed that participation in the discussion was mandatory, the only consequence of non-participation was a note in the student's advising file and continuous email reminders. This proved to be effective motivation for incoming students and resulted in the aforementioned 97% participation.

Each discussion was 90 minutes in length, with time allotted for students to introduce themselves to the group. Facilitators used questions from a facilitation guide to lead the discussion, varying formats between full group discussion and questions answered in pairs or smaller groups. Questions were generated during the book selection process and also during the facilitator training session. Facilitators were given a long list of potential questions to select from, depending on their own personal interests and the level of engagement of the group for a particular topic.

In an effort to test scalability of the program and effectiveness of different group sizes, we piloted two formats: 1) traditional small groups of 25 students or less, led by a pair of volunteer student facilitators from the junior and senior class and 2) large group format, including 50-75 students, led by a team of four volunteer student facilitators. In the traditional small group format, students were arranged in a circle for the discussion, but were instructed to talk with a partner for select topics. In the large group format, students were arranged in tables of 5-6 students and discussed each question within the smaller group, before sharing their opinions with the larger group.

By comparing the small group and large group format, we observed significant advantages (p-value<0.001) for the small group participants in the areas of perceived value in reading the book, intention to participate in future events and belief that the program should be continued for future students. Small group participants also demonstrated significant advantage (p-value<0.001) in terms of the discussion changing their thinking about "what it means to be an engineer" which directly relates to one of the program objectives: "to facilitate meaningful discussions regarding the role and responsibility of an engineer in society, as well as emphasize the importance of engineers developing competencies beyond the technical". The large group format provided significant advantages in the areas of intention to leverage experiences across campus (p-value<0.001) and feeling connected to other Michigan Engineering students (p-

value<0.01), which relates to the second program objective: “to create the feeling of a community of scholars, particularly among incoming engineering students”. Table 3 provides a comparison of specific response information. While both formats were effective in meeting program objectives, the small group format appears to be more effective overall. Based on these findings, we will continue the small group format, but incorporate new opportunities for students to talk in groups of 4-5 students, in an effort to mirror the student connection aspects and community-building aspects of the larger group format.

Table 3. Discussion format comparison.

Post-Discussion Survey Element	Small Group* (N=793)	Large Group* (N=457)
Q1. Reading this book was valuable to me.	3.85	3.76
Q2. The book discussion was interesting and engaging.	3.68**	3.64**
Q3. The Common Reading Experience helped me connect with other Michigan Engineering students.	3.51	3.65
Q4. The Common Reading Experience helped me feel a stronger connection to the Michigan Engineering community.	3.47**	3.45**
Q5. I plan to attend additional events related to the Common Reading Experience during the academic year.	3.21	3.09
Q6. The Common Reading Experience should continue for future students.	3.81	3.66
Q7. I plan to leverage the experiences available across the University of Michigan campus to enhance my engineering education.	4.20	4.35
Q8. The Common Reading Experience helped me think in new ways about what it means to be an engineer.	3.97	3.83

*Average response, based on a Likert scale of (1) strongly disagree to (5) strongly agree

**An independent samples t-test indicated p-value > 0.01 and no significant different found for Q2 and Q4.

Enrichment Events

In the first year of the program, we attempted several enrichment events throughout the academic year, including guest speakers in a variety of classes, partnering with our study abroad office to encourage participation based on themes in the book and incorporating a special category into a long-standing essay contest. As a keynote event, we invited entrepreneur David Meritt to discuss his apparel company within the context of *The Travel of a T-Shirt in the Global Economy* by Pietra Rivoli. Throughout the year, we observed a decrease in participation. Feedback from our Undergraduate Student Advisory Board suggests that events within 1-2 month of the initial discussion are most interesting to the students and we subsequently focused on that timeframe.

For the second year of the program, we brought William Kamkwamba, author of *The Boy Who Harnessed the Wind* to campus to speak with the Michigan Engineering community. This event took place within two months of the final discussion groups and held a large appeal to the participants. Along with other members of the Michigan Engineering community,

approximately 600 first year engineering students attended this optional event, which represents nearly half of the program participants. Based on this experience, we will focus on the first two months of the semester for future common reading program events.

In response to the program, a small group of volunteer student discussion facilitators created a new student organization called The Common Reading Experience Student Advisory Board in a grassroots effort to develop enrichment events in future years. The group is planning a student-led volunteer trip to Malawi for May 2015, inspired by conversations with William Kamkwamba.

In addition to the keynote speaker event, we encourage faculty teaching in our first year courses to leverage the Common Reading Experience in class. In one section of a required first year engineering course, faculty asked students to create a water footprint of the t-shirt in *The Travels of a T-Shirt in the Global Economy* using information derived from the book. In an elective entrepreneurship class, faculty created a themed-semester and asked guest presenters to link their topic to concepts from the selected book. These efforts could prove to enhance the overall experience and integration of the program into the undergraduate experience, but have not been fully leveraged at this time.

IV. Comparison

Intended Outcomes and Facilitation

While UVa-SEAS utilizes a faculty-led discussion model and Michigan Engineering leverages a student-led model, both focus on similar outcomes, including building community among first year students and encouraging students to think about engineering beyond the technical aspects. Both programs benefit from a group training for facilitators, where common questions are developed to support these themes.

Book Purchase and Selection

Michigan Engineering provides books at no cost to the students, while UVa-SEAS requires students to purchase books. Michigan Engineering engages student focus groups to recommend a selection, while UVa-SEAS process relies heavily on faculty input. Both programs provide an opportunity for members of the community to recommend selections throughout the process. Regardless of the selection method, both institutions focus on books that are recently published and connect to multiple themes for the discussion. Similarly, although the book selection connects to engineering tangentially at a minimum, most of the choices for both institutions are not explicitly engineering topics. This provides an additional opportunity to discuss the broad aspects of engineering as a discipline and participants are engaged using discussion topics such as “Why do you think this book was selected for an engineering common reading experience?” The availability of the author to visit campus for a culminating event is a consideration, but does not preclude a particular selection for either institution.

Book Discussions

UVa-SEAS holds book discussions during the orientation program, before classes begin, while Michigan Engineering holds the discussion during the first two weeks of the semester. Book discussions include elements that address the intended themes and also provide ample time for students to interact and get to know each other and the discussion leader(s). Engaging students in the discussion before they are fully immersed in their coursework is beneficial to participation and interest level.

Faculty Involvement & Enrichment Events

UVa-SEAS program was designed to maximize faculty involvement and takes into consideration the importance of faculty contact with students in terms of retention in engineering. Conversely, Michigan Engineering's program relies more heavily on student leadership, which has resulted in difficulty engaging faculty in the program. Some limited success has been achieved in encouraging faculty to integrate elements of the reading into first year courses, but more exploration is needed to evaluate the success of these measures. Student participation in common reading related events during the first semester is higher than for similar events later in the year, indicating that the core of discussion and enrichment events should be completed early in the academic year.

V. Conclusion

Common reading programs designed specifically for engineering students show positive effects related to modeling intellectual engagement, broadening perspectives about the role of engineers in society and creating connections between first year students and the larger engineering community. While individual institutions design their program based on institutional culture and resources available, certain aspects such as program timing, book selection, discussion size and inclusion of specific discussion elements contribute to overall program success.

Although initial evaluation indicates that common reading programs are successful in building community and broadening engineering students' perspectives, future work including the use of a control group and a longitudinal study of student engagement could provide additional insight into the effectiveness of such programs. Additionally, an exploration of educational gains for current students involved in the book selection process or discussion facilitation could identify additional gains within a smaller subset of the student population.

References

- [1] Patterson, L. New ideas in first-year reading programs from around the country. *First-Year Experience Newsletter (FYE)*, vol. 143, p. 8-9. 2002.
- [2] Ferguson, Michael. "Creating Common Ground: Common Reading and the First Year of College." *Peer Review*, p. 8-10. Summer 2006.
- [3] National Research Council. *The Engineer of 2020: Visions of Engineering in the New Century*. Washington, DC: The National Academies Press, 2004.
- [4] National Research Council. *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*. Washington, DC: The National Academies Press, 2005.

Appendix

A1. Book Selections

University of Virginia-School of Engineering and Applied Science

- 2014 Ingenious by Jason Fagone
- 2013 The Shallows: What the Internet is Doing to Our Brains
- 2012 To Engineer is Human by Henry Petroski
- 2011 Packing for Mars by Mary Roach
- 2010 The Viking in the Wheat Field: a Scientist's Struggle to Preserve the World's Harvest by Susan Dworkin
- 2009 The Tipping Point by Malcolm Gladwell
- 2008 America 1908 by Jim Rasenbergeto
- 2007 Endurance: Shackleton's Incredible Voyage by Alfred Lansing
- 2006 Brave New World by Aldous Huxley
- 2005 The Rocket Boys by Homer Hickham, Jr.
- 2004 The Human Factor: Revolutionizing the Way People Live With Technology by Kim Vicente
- 2003 Hacker Cracker: A Journey from the Mean Streets of Brooklyn to the Frontiers of Cyberspace by Ejovi Nuwere
- 2002 Ender's Game by Orson Scott Card
- 2001 Thinking in Pictures by Temple Grandin
- 2000 Managing Martians by Donna Shirley
- 1999 Ship of Gold in the Deep Blue Sea by Gary Kinder
- 1998 Airframe by Michael Crichton
- 1997 A Civil Action by Jonathan Harr
- 1996 Soul of a New Machine by Tracy Kidder
- 1995 A Scientist in the City by James Trefil
- 1994 The Control of Nature by John McPhee
- 1993 The Final Forrest by William Dietrich and The Tragedy of the Commons by Garrett Hardin

University of Michigan, College of Engineering

- 2014 The Boy Who Harnessed the Wind by William Kamkwamba and Bryan Mealer
- 2013 The Travels of a T-Shirt in the Global Economy by Pietra Rivoli

A2. Post-discussion evaluation questions used by the University of Michigan

For the following questions, participants were asked to respond with one of the following: Strongly Agree, Agree, Neutral or N/A, Disagree or Strongly Disagree

- Q1. Reading “The Boy Who Harnessed the Wind” was valuable to me.
- Q2. The book discussion was interesting and engaging.
- Q3. The Common Reading Experience helped me connect with other Michigan Engineering students.
- Q4. The Common Reading Experience helped me feel a stronger connection to the Michigan Engineering community.
- Q5. I plan to attend additional events related to the Common Reading Experience during the academic year.
- Q6. The Common Reading Experience should continue for future students
- Q7. I plan to leverage the experiences available across the University of Michigan campus to enhance my engineering education.
- Q8. The Common Reading Experience helped me think in new ways about what it means to be an engineer.

Participants were asked to respond to the following additional questions:

Please list 3 skills/qualities that you think are important for an engineer:

How much of the book did you read? 100% 75% 50% 25% None

Was the book a good length?

Too long Too short The length of the book was appropriate.

Would you prefer an eBook or paperback copy of the book?

eBook Paperback No preference

If you selected eBook, what type of reader could you use to read eBooks? (Please check all that apply.) Kindle iPad iPhone Nook Android Kobo Sony Reader Other

What did you like about the Michigan Engineering Common Reading Experience?

What did you dislike about the Michigan Engineering Common Reading Experience?

What would you change about the Michigan Engineering Common Reading Experience for future students?

What do you think is the purpose of the Michigan Engineering Common Reading Experience?

Additional Comments: